ENGINEERING AND MINING JOURNAL

JUNE, 1941

One step in aluminum production from bauxite. Alumina-drying rotating kilns in operation, Mobile, Alabama, plant of Aluminum Ore Company

PRICE 50 CENTS

In this issue

Nanisivik—Pioneer Frontier
Pumping Plant Electrified at Ranisfors
How to Refine a Low-Grade High-Copper Gold Precipitate
Nine Lincoln Mine Treating Six-Dollar Ore Profitably
Differential Haulage at Wakefield Mine
Complete Contents on Page 27

CASE HISTORY

of File Covering Practically Every HYDROSEAL PUMP

PUMP INSTALLATION DATA

C-125707 Date: 1/10/36

Customer: [redacted] Location: [redacted] Agency N.E.Co.

Service: Classifier Overflow Pump Fr.& Type: 8-41-1 Serial No. RH409CUH

Size Material: 65 Mesh Sp.Gr.Solids: 3.4 Sp.Gr.Sol. 1.27

Tons Solids/Day: 600 % Solids: 28% US GPM: 300

Suction Conditions: Ft.Pos.Hd: 3' Ft.Neg.Hd: —

Pipe Size & Length: Suction: 6"-3' Discharge: 4"-60'

Vert.Discharge Lift: 28' Fric.Loss/C: 5' Pipe Line Vel. 7.66

Elbows & Valves: 2-90° Ells. Est.Hd. 38' Seal Pres: 30#

Motor Char: 1½HP-1740RPM Pump Speed: 750 RPM Act.HP Rec'd: 5.4

Est.HP Req'd: 5.3 Drive: OHB-V-Belt Motor Pulley: 5.6" Pump Pulley: 13" Belts: 4-7B1

REMARKS:

C-125707

Name of Customer [redacted]

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Contract	LINER No.	LINER Mix	IMPELLER No.	IMPELLER Mix	SS BELL LINER No.	SS BELL LINER Mix	ES BELL LINER No.	ES BELL LINER Mix	SUC. SLEEVE No.	SUC. SLEEVE Mix	WEAR RING No.	WEAR RING Mix	MISC.	TOTAL PRICE
6/24/36-12310	1	1069	1	1069	1	1069	1	1069						XXXXX
2/4/39-13225							1	1069					✓	XXXXX
12/19/38-15921					1	1069			1	414			✓	XXXXX
10/23/39-17268					1	1069			1	5341				XXXXX
11/27/40-19116					2	1938								XXXXX

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▼

Per capita consumption of salt in the United States, according to the latest population census, amounted to 151 lb., compared to 123 lb. in 1938. This does not mean that a man eats his weight in salt every year, as the portion assimilated directly at table, in food, and for household purposes is relatively small, with fully 50 per cent of the annual output used in chemicals and another 25 per cent, at least, for other industrial purposes. However, the immensity of the salt industry has been cited in a recent Bureau of Mines release which gives some interesting statistics of the industry. Salt output in 1940 from 83 plants of 66 companies in 13 states and Puerto Rico totaled 10,003,448 short tons, valued at $26,118,107, compared with 9,277,911 short tons, valued at $24,509,680, in 1939. Increases were distributed among the three classes of salt—manufactured, rock salt, and also salt in brine, which accounts roughly for half the total tonnage.

H. C. PARMELEE
Editor

ENGINEERING AND MINING JOURNAL

H. W. CLARKE
Vice-President

Published by McGraw-Hill Publishing Co., Inc.

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Publication Office: 99-129 N. Broadway, Albany, N. Y.
Editorial and Executive Offices: 330 W. 42d Street, New York, N.Y. Cable Address: McGraw-Hill, New York
Branch Offices: San Francisco, 68 Post St.; Chicago, 520 N. Michigan Ave.; Washington, D. C., National Press Building

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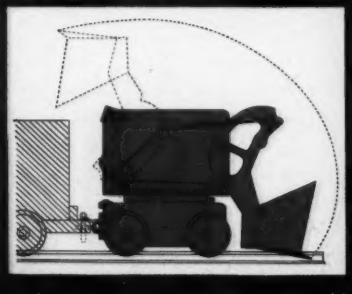

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Volume 142 JUNE, 1941 Number 6

Summer Recruits

SUMMER VACATIONS are at hand, and a few hundred students in mining schools will be looking for work in mines and ore-treatment plants. Primarily they want experience in the industry in which they hope ultimately to find careers. The money they earn, although of secondary importance, will help defray the expense of their education. How easy will it be for them to get jobs? That depends largely on the managers and superintendents who once had to get their start in much the same way. One mining educator tells us that labor regulations are making it more difficult for students to get summer work, but he feels that it is up to the active members of the mining engineering profession to find ways whereby these young men can gain a vital part of their education. We pass the thought along with hearty approval.

Decline of Mexican Mining

SOME TIME AGO we received from the Secretary of National Economy, Mexico, a directory of mining companies in the Republic for the years 1938–39. The document was superficially impressive, listing 879 mining properties. But an analysis of the contents and a review of other sources of information suggested that all is not well with the mining industry of Mexico.

For example, of the 879 properties listed in the directory, 559 are idle. Of the remainder, 225 are worked intermittently, each producing less than 100 metric tons of ore monthly. Sixty properties in continuous operation produce only between 100 and 1,000 metric tons each per month. A few are more productive, each of seven yielding from 1,000 to 10,000 tons monthly, and sixteen producing more than 10,000 tons each. Included in the last two groups are one large coal property and one iron-ore mine. So out of 879 properties fewer than 100 can be considered important mining operations. The great majority are either idle or nearly so.

A further clue to conditions is found in statistics of Mexican metal production for the past six years, shown in the accompanying table. Inspection reveals a peak of production, except for silver, about the middle or latter part of the period, followed by a decline in some instances to lower levels in 1940 than in 1935. Data for gold, copper, lead, and zinc are of Mexican origin and represent recoverable metals in ore produced. Silver production is from the American Bureau of Metal Statistics.

The Mexican Government should wake up to

Mexican Metal Production

	Gold, Kilos	Silver, Ounces	Lead, Metric Tons	Zinc, Metric Tons	Copper, Metric Tons
1935	21,223	75,587,447	184,193	135,921	39,372
1936	23,451	77,462,114	215,723	150,250	27,713
1937	26,326	84,678,921	218,133	154,624	46,077
1938	28,734	81,016,939	282,368	172,217	41,851
1939	26,178	75,869,000	219,506	134,166	44,389
1940	27,468	82,638,000	196,253	108,955	37,602

the fact that its principal industry seems to be on the wane, and that its chief source of revenue, as well as that of the National Railways, is on the decline. It should realize that mines are wasting assets, and that unless prospecting, discovery, and development are encouraged, and mining itself is made more attractive by less burdensome taxation and more equitable administration of law, men will not engage in it and the industry will ultimately die. Taxation is drastic when, as in the case of 40 mining operations, an average of 90 percent of net earnings was taken for taxes. No one believes that Mexican mineral resources are exhausted, or that the mining industry has necessarily passed its peak. On the contrary, many believe that a more enlightened attitude on the part of the Government would contribute greatly to a revival of the industry. The choice is Mexico's; likewise the consequences.

If Mining Stops

IN ADMINISTERING PRIORITY regulations special consideration will have to be given to manufacturers of mining and ore-processing equipment, and replacement parts therefor, much of which constitutes a mining company's monthly bill of supplies. Drills, loaders, hoists, pumps, crushing and grinding machines, concentrating tables, flotation cells, and a long list of standard equipment must be

maintained in good order or replaced if mineral production is to continue without interruption. And that means that manufacturers must carry adequate stocks of replacement parts and complete units. When mining stops, the defense program will bog down for lack of metals.

The priorities division of OPM is aware of this fact, and its critical importance is well understood by Dexter S. Kimball, chairman of the Tool and Equipment Priorities Committee. He is an experienced industrial engineer who senses the situation and will take steps to keep equipment and parts flowing freely to defense industries. Nevertheless, remembering that the squeaky axle gets the grease, mining companies that are unable to get critical supplies should make themselves heard by the manufacturers, and the latter should acquaint Dean Kimball with the situation. It ought not to be up to individual mining companies to get priority ratings; that should be the concern of the manufacturer. But both will have to be insistent that essential machines and parts be made available.

Aluminum, for Example

SPIRALLING UPWARD at a fantastically high rate, the demand for aluminum emphasizes the magnitude of the national defense program. Consider the domestic figures: Average annual peace-time consumption for nine years, 1930–38, about 168,000,000 pounds; for 1939, 324,000,000. Suddenly defense demand jumped production to 420,000,000 pounds in 1940. The rate for 1941 is 600,000,000 pounds, and for 1942 about 900,000,000 pounds. But even this is small compared with the extraordinary estimate last month of a need for 1,600,000,000 pounds annual capacity. In short, the projected demand for defense purposes alone is now nearly ten times the annual peace-time use for almost a decade. Small wonder that the metal is not available for pots and pans, and that rigid priorities govern its use.

Do these figures represent sober, reliable estimates based on a carefully calculated military program? We doubt it. They represent rather a decision to try to get ahead of a military program that shifts and grows from month to month as the emergency becomes more realistic. Past estimates have had to be revised almost before the figures were cold; so the defense officials at Washington will tell you that they have now decided "to get enough."

Well, decision is one thing, and getting aluminum is another. Present "built or building" capacity for aluminum production in this country is roundly 900,000,000 pounds per annum, divided about 90–10 between the Aluminum Company of America and the Reynolds Metals Company, respectively. Full production will be reached about the middle of 1942. And we can get another 200,000,000 pounds from Canada. But this still leaves us short by 500,000,000 pounds, or much more than the total 1939 domestic production.

It is now recognized that the Government will have to finance this additional capacity. Thus far the Aluminum Company of America has financed its own tremendous expansion to several times its average annual peace-time output in the decade of the nineteen-thirties. Reynolds has been financed wholly by the RFC; in fact, has been encouraged by the Government to enter the field. But from now on, new plants must be government-built.

Who shall operate them? This question finds realistic OPM aligned against academic and anti-monopoly-minded New Dealers who, even in a national emergency, don't forget their precious policies. The prospect of one or two government aluminum plants to serve as "yardsticks" after the war looks attractive to them, and they will get them if possible. Of course, anyone in his right mind, interested in maximum production, would engage the most skillful and experienced operator, but that may not be done. Ickes and other zealots have a different plan to encourage competition even though production is reduced.

Consider for a moment what it means to produce an additional 500,000,000 pounds of aluminum per annum. At the rate of four pounds of bauxite per pound of metal it will require another 1,000,000 tons of ore. Then ships must be found to bring most of it here from the Guianas; new capacity for making alumina must be built; new reduction works must be constructed and ample electrical energy provided at the rate of 10-12 kw.-hr. per pound of metal produced. Finally, rolling mills and fabricating plants must be built. From ore in Guiana to airplanes in the United States, aluminum has to travel a long road supervised at every turn by experts. Politicians and magic wands are not of much use in the process.

So much for aluminum as an example. Magnesium presents many of the same problems; and nickel producers are not without their perplexities. All of the metals are similarly affected in some degree. There isn't enough of them to go round, so they have to be requisitioned first for defense. Copper and zinc are already rationed. If you find it difficult to keep abreast of the rapidly shifting scene, you can take comfort in the fact that defense officials haven't an easy time of it either. The whole situation is as fantastic as it is critical.

Reflections from Washington

PROCLAMATION of "unlimited national emergency" by President Roosevelt was actually a recognition of undeclared international war. This is an oversimplification of Washington, but probably not far from the correct interpretation of the President's fireside chat of May 27. Acceptance of this interpretation does not imply that the President is seeking war. It does not imply an intention of going to war. It is simply a realistic statement of facts which were inescapable.

The proclamation by the President did not add new powers very much greater than those which were actually being exercised previously. The new proclamation of full emergency does, however, give enforceable status to many undertakings previously pursued with the consent of the regulated units.

Priority controls are fully legalized by the new act approved by the President at the end of May. The basis is thus laid for a complete rationing of all types of materials as the need arises, and this rationing will be far more extensive than most people realize.

Of outstanding importance to the mining industry are the comprehensive orders on zinc and copper. These follow the general pattern of priority rulings fixed earlier for the strategic metals. And they forecast like action on almost all the other mineral and metal products which are of industrial importance.

More "Critical" Metals

THE REVISED PRIORITIES critical list issued in May included numerous metals not previously so listed. The new announcement says, "It will be noted that all metals except a few precious ones are now covered by this list." This means that substantially every processor and user of metals must market or procure these commodities subject to priority rulings. Furthermore, if a metal is on the list, all fabricated, mechanical, or electrical component parts and accessories necessary are also by inference included.

Despite the sweeping nature of these priority rulings, it is to be noted that only a few metals are being subjected to complete priority rulings. Most of the allocations and restrictions are still being achieved by voluntary industry action. But violation of a "voluntary" rule may bring penalties quite as severe as though formal regulations were being broken.

Any miners or sellers of metal interested in getting the distinction between informal priorities and more formal proceedings can profitably study such regulations as were issued for nickel on May 19. Under the terms of the order of that date the OPM Division of Priorities will make month-by-month allocations of the available nickel supply.

By Special Correspondent

Occasionally, a few allocations can and will be made for non-defense uses on a limited basis in order to avoid too serious dislocation of civilian manufacturing activities.

Copper Control

COPPER has been added to the list of vital defense metals placed under mandatory, industry-wide control, E. R. Stettinius, Jr., Director of Priorities, announced May 31. At the same time, a civilian allocation program for copper was issued by Leon Henderson, head of the Office of Price Administration and Civilian Supply. The Office for Emergency Management's request, known as General Preference Order No. M-9, became effective June 1. Total defense and civilian demand for copper, it was declared, is in excess of the available supply and it is necessary, after defense needs are satisfied, to provide for the equitable allocation of the residual supply of copper for civilian needs.

Mr. Stettinius said that figures indicated that the total supply of refined copper in this country during 1941 will range between 1,340,000 and 1,470,000 tons. Total military and civilian requirements are estimated at about 1,810,000 tons, indicating an over-all shortage for the year of from 340,000 to 470,000 tons.

To provide for an even flow of copper against emergency needs, refiners have been asked to set aside 20 percent of production each month, beginning June 1.

Stockpile Progress

STOCKPILES of important metals and minerals were described by OPM on May 26 as follows:

Chromite: Stockpile sufficient to supply industry for more than a year at current rate of consumption. Much more has been orderd, and domestic production is being encouraged.

Copper: Orders of considerable quantities have been placed with Chile, and delivery of first 100,000 tons being completed.

Graphite: Stockpile adequate to supply industry nearly a year at present rate of consumption.

Manganese: Stockpiles sufficient to meet industrial needs for 16 months. Probable domestic production, plus Cuban deliveries, could supply industry through 1943.

Mercury: Domestic output has risen to record heights. Total stocks are adequate to supply industry for more than half a year.

Mica: Stockpile enough to supply industry for more than a year. New sources in Western Hemisphere being investigated.

Nickel: Current supplies are low, but most of world supply is in Canada and defense requirements are assured.

Quartz Crystal: Stockpile is sufficient for some months and growing.

Tin: Present stock will supply industry more than a year. Large tonnage ordered from China. Bolivia to deliver 18,000 tons a year for five years.

Tungsten: Stocks are low, largely due to an interruption of imports while the Burma Road was closed. Domestic production being stepped up so that peacetime needs can be met without imports. Substitutes are being studied.

Zinc: Shortage being met by partial priority control and expansion of existing plants. Domestic supply could be supplemented by purchases from other nations of the Western Hemisphere.

More Capacity Wanted

ESTIMATES of defense requirements have been multiplied recently so that more metal-supply requirements are being imposed than anyone seriously anticipated three or four months ago. Some criticism has arisen; but the fact appears to be that the actual magnitude of the job has grown, not merely the government estimates.

The mining industry probably cannot follow most of the suggestions being made by OPM and other government officials seeking to accelerate manufacturing. Sub-contracting, for example, has no place. But certain other speed-up recommendations may be pressed. Certainly the industry is going to be asked to consider full-time operation—that is, 21 eight-hour shifts a week, for some kinds of business. Elimination of seasonal factors may be sought in a few cases. The "all-out" effort means continuous all-hour effort and full-time employment of equipment wherever possible.

Labor Shortage

A MAJOR LIMIT on further expansion of industry is being experienced because of labor shortages. There is serious shortage of certain types of employees vital to coordinated expansion of many first-class present businesses. This is notable in the fields of explosives manufacture, ordnance production, and aircraft building. As yet it has not been noted in Washington that there is comparable lack of skilled service in mining or primary metallurgy.

Perhaps the best evidence of the seriousness of this whole situation is found in recent efforts which are virtual blanket exemptions for certain classes of technical people. Selective Service headquarters has practically ordered all local

draft boards to defer many types of engineers and chemists, as well as medical, dental, and related professional workers. These deferments extend even to undergraduate students of technology and medical subjects.

The mining and mineral industries are more likely to experience difficulty through the hiring away of many of their skilled workers who certainly could be adapted to important artisan and super-artisan positions in defense manufacturing. As yet, Washington has taken no official steps to guard against this movement. In the Northeastern States the situation is already critical, and reports are beginning to arrive from the mining districts of the West and Northwest.

Anti-trust Policies

CONSIDERABLE FREEDOM of action by industries is being accorded to those committee projects that are carried out in cooperation with OPM and OPACS or other defense units. Attorney General Jackson has indicated the intention of his department to withhold any anti-trust proceedings where bona fide co-operation in the public interest is being carried out with these public authorities concerned with preparedness.

The officials of OPM and OPACS may decide as to whether a committee is necessary on any subject to represent an industry. If they believe it necessary, then Justice says that it is proper to go ahead and cooperate, making any agreements necessary for defense purposes. Doubtful cases will be cleared by the Department on request. The Department proposes also to keep strict watch of these arrangements and to request industry groups to refrain from what may be "unnecessary" cooperative arrangements.

Tariff Changes

IN FURTHER EFFORT to gain Hemisphere solidarity, the State Department renewed during May trade agreement negotiations with Argentina and Uraguay. Official announcement was made on May 14 of the commodities which will be considered for cutting present tariff duties imposed by the United States. Numerous minerals and mineral products are up for consideration. Included in the State Department list for Argentine negotiations are: Beryllium and beryllium compounds; onyx; mica, both unmanufactured and ground; tungsten ore or its concentrate; and miscellaneous minerals either crude or only slightly advanced by manufacture.

Tin Plans

METALS RESERVE CO. is continuing actively its tin purchases from the international tin cartel. Orders for 37,500 tons of metal at 50c. a pound have been placed for delivery in the latter half of this calendar year. Another purchase of the same size is expected for the first half of 1942 if the control plan is renewed. This metal is going into the reserve stockpile of the government.

Near the end of May, it was announced that Ford, Bacon & Davis, Inc., would build the new smelter for Tin Processing Corp. at Texas City, Tex. Construction was to begin the first of June on this RFC-financed project, which will cost the government about $3,500,000.

Aluminum Shortage

BY JUNE OPM expects no margin of any aluminum production above actual defense requirements. Actual deficiencies in supply are presumably to come by July or August.

June production of aluminum is expected at the rate of 640,000,000 lb. per year. July rate may reach 800,000,000 lb. The requirements next year will be double this largest figure. And it is hoped that construction and power supply will be available to permit that speed.

The urgency of this situation has occasioned a most interesting plan for scrap recovery. A trial of this plan for collecting scrap metal, pots and pans, etc., was scheduled for the first week of June near Richmond, Va., and Madison, Wis.

News "Fines"

Quicksilver Monopoly — Under this heading we published a short item last month, page 34, that gave the erroneous impression of referring to a monopoly in the domestic quicksilver industry. The error was ours. In editing the item we deleted reference to the Italian-Spanish Cartel but failed to modify the heading. There is a foreign monopoly in quicksilver but none in the United States. Our apologies to domestic producers.

Mine Inspection Law—The President signed on May 7 the law creating a Federal coal mine inspection service in the Bureau of Mines. The Bureau has requested an initial appropriation of $1,250,000 to start work on the training and experience of the mining engineers in the necessary inspection service.

Paid Vacation—Certain mining and metallurgical firms which are extremely busy are being complimented by OPM for giving a pay bonus in lieu of a paid vacation. This conforms with the government's effort to get increased production without sacrifice of labor standards.

Repair Parts—If repair parts or replacement equipment is needed, and deliveries are slow or difficult, priority can be had in some cases. To get priority one must show that he is mining or processing material essential to government defense orders. The person to whom he sells the ore or mineral can get for the mining company such priority only if the goods are going into a line of commercial transactions which leads directly to defense manufacturing.

Power Rationing—Shortage of rainfall in certain areas, especially of the Tennessee Valley, is causing power shortages. Certain metallurgical users of government power are, therefore, being rationed. Certain processors of phosphate rock, including the TVA fertilizer division itself, are shutting down furnaces so that aluminum, ferro-alloys, and other more essential products can have more nearly adequate energy supply.

Inventory Plan—Inventory regulations of OPM are being organized by L. J. Martin, formerly assistant to the president of Thomas A. Edison, Inc. Sixteen metals or classes of metals will be subject to inventory control according to the plans fixed in May. Industry cooperation is being sought to facilitate smooth working of this complicated job, which will now apply to antimony, cadmium, chromium, cobalt, ferro-alloys, iridium, iron and steel products, lead, manganese, mercury, molybdenum, most nonferrous alloys, tin, vanadium, and secondary metals or scrap containing these specific metals. Copper was on the original list, but removed when that metal was placed under mandatory control on May 31.

Export Controls—Four additional metals or minerals were placed on the list requiring license for export by official order published May 13. These items are columbium, tantalum, cryolite, and fluorspar. Additional mercury compounds and certain copper salts and additional brass and bronze products are also subject to export control.

Canadian Cooperation—A committee to act jointly for United States and Canada will take up practical methods for exchanging information on strategic raw materials and a basis for actually releasing commodities in one direction or the other for mutual advantage. Without awaiting action of this committee, RFC has consented to buy a large quantity of Canadian aluminum partially to fill the gap in American supplies.

Taxing for Reform—One of the most frank admissions of the New Dealers' intention to use the power of taxation for further social reform was given in the presentation by Price Administrator Leon Henderson in his appearance before the Ways and Means Committee of the House of Representatives early in May. Taxes, according to this ardent reformer, should be used to prevent people from spending money on other things, thus extending the Government's control of the private individuals' incomes. Congress will probably be a bit more realistic (and conservative) in its actual legislation.

Revolving Fund—Congress is authorizing the Treasury Department to respend any money which is received in payment for strategic materials utilized out of the stockpiles which it controls.

Labor Crackdown—In his May 27 fireside chat, the President virtually promised a crackdown on striking labor. He also promised to preserve the social gains which labor has achieved. If the President does not stop strikes which interfere with defense production, Congress will. And regardless of the President's promises, Congress is likely to take the 44-hour week away from labor for the duration, if there is any more evidence of a shortage of skilled labor holding up defense expansion. This does not mean an anti-labor sentiment growing in Congress. It means that Congress is more afraid of the public indignation than it is of the short-sighted trouble-making labor leaders who have caused or permitted recent defense strikes.

HONDURAS Pioneer Frontier

The Department of Olancho closely resembles California in its primitive days, with opportunities for development of placer mining

Charles S. Haley
1947 Yosemite Road
Berkeley, Calif.

Prospecting with caisson

LAST SUMMER it was my privilege to journey to the interior of the Department of Olancho, in eastern Honduras, and it has occurred to me that some comment on this very interesting country would be of value to others whose business might call them on a similar journey, or who might have other cause for being informed.

Above an elevation of 1,500 to 2,000 ft., the climate of Honduras is temperate and easy of human habitation. The average range of temperature is from a low of 40 deg. F. to a high of 85 deg. On the coast and at lower elevations the temperature sometimes rises higher, and there is considerably more humidity, but the air in the uplands of the interior is relatively dry and bracing. During the rainy season, which normally extends from June through October, the upland country in particular is subject to sudden hard showers, which are intermittent throughout the day. It is always possible, although not always desirable, to work through the entire rainy season.

The country is not, as many think, a tropical one. To one who has spent a long time in the real tropics, the spacious cleanness of the grass-covered pine forests makes one think of California Sierra foothill country. The only thick growth of brush and vines is in the immediate vicinity of the rivers, and on these the bars are easily cleared with axe and machete at an expense of not over a cent per yard of the workable gravels on the bars.

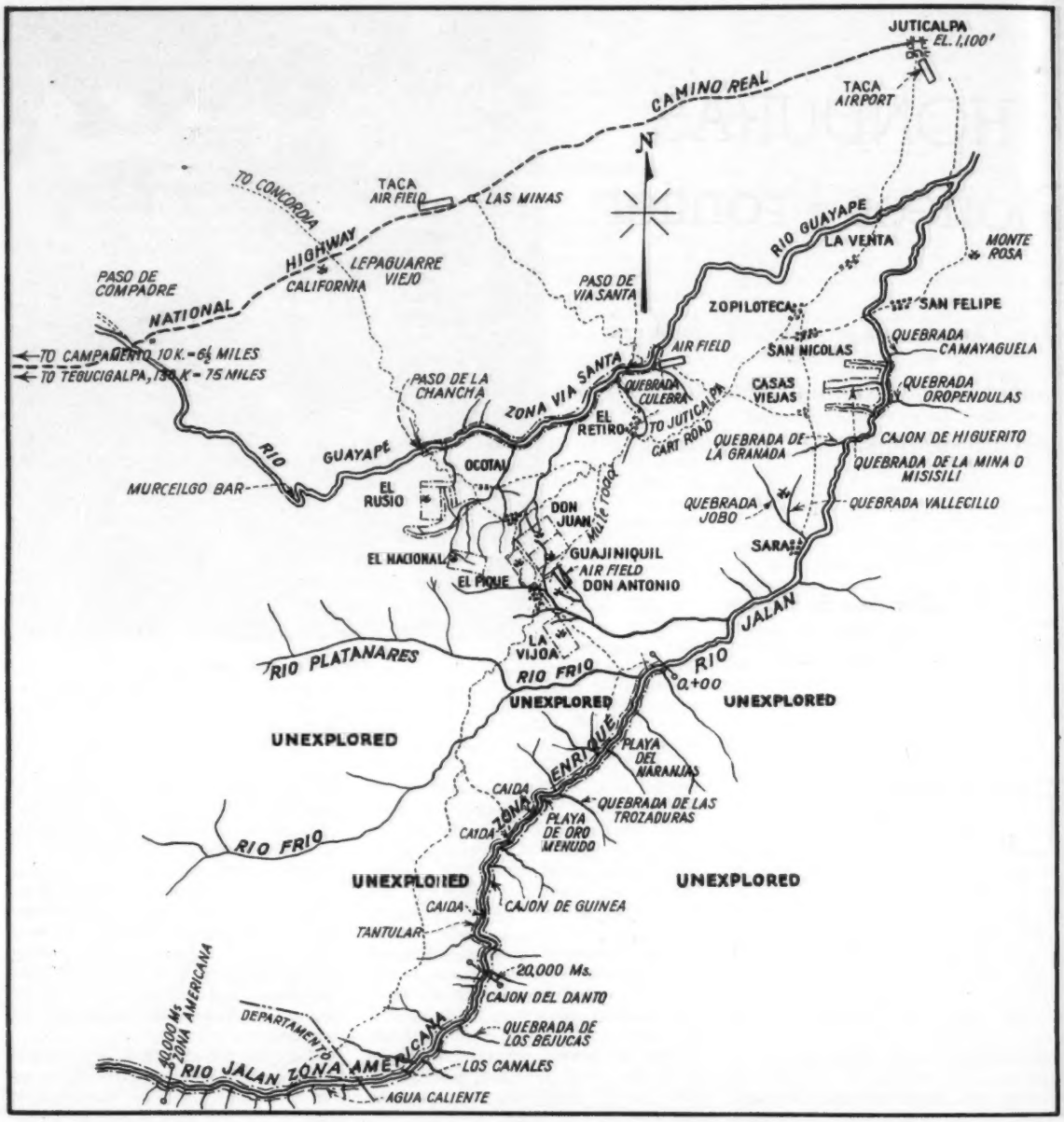
The insect problem, while troublesome in the rainy season, is not comparable to conditions elsewhere in Latin America where many Americans have conquered the problem. It is not even necessary to wear a head net while working. A smudge and a liberal smearing of face, neck, and arms with machine oil a couple of times a day insure comparative comfort. During the dry season, one always had to be on the watch for ticks, but this is also true of many parts of Nevada and even of California.

Transportation—There is one main truck road from Amapala, on the Pacific, to Tegucigalpa, which has recently been extended easterly to Juticalpa, the capital of Olancho. Branch roads extending to other cities are not good except for ox-cart travel. On the north coast, a railroad runs from Puerto Cortez, western terminal, to La Ceiba, on the east. With the impetus now being given by the Pan-American highway, however, the Republic of Honduras is carrying forward as ambitious a road-building program as its limited finances will permit.

The real mainstay for fast travel in the country is air transport. With the establishment of the Pan-American air service to Tegucigalpa, a local company, called TACA (Transportes Aeros Centro-Americanos), has been developed until it now covers the principal cities of Honduras, Guatemala, Salvador, Nicaragua, Costa Rica, and Panama. With this service it is possible to travel through most of Honduras and to have fast freight service and mail in some of the most inaccessible regions. I have myself received on the fifth day mail written in San Francisco, and delivered to me by runner at Vijao, 40 miles out of Juticalpa.

There are two standard ways of getting into the country. The first by Pan-American plant to Tegucigalpa, a matter of two days from San Francisco or one day from Brownsville, Tex. The second method is to take either United Fruit steamers from New Orleans or New York to Tela or Cortez, on the north coast, or Standard Fruit boat from New Orleans to Ceiba. From either of these north coast ports, you take a TACA plane to Tegucigalpa or other interior points.

In addition to this, you can always take a coasting steamer down the Pacific coast and go in by road from Amapala to the capital. A fourth method, which will be popular as soon as the Pan-American highway reaches Tegucigalpa, will be to take an auto or auto stage all the way through. By that time, Honduras will probably have a number of branch highways from the capital to principal cities.



Upper Guayape district, Department of Olancho, Honduras

These are either projected or being built as fast as limited funds will permit.

The first important resource which appeals to you in air travel is the enormous amount of good standing timber. The mountains for miles are covered with forests of standing pine, intermixed with no inconsiderable forests of "cedros"—similar to our cedar. Caoba (mahogany) is prevalent all over the lower stretches of the rivers. The next thing that impresses you as you travel by mule-back is the thousands of acres of rich bottom and grazing lands which are as yet untouched. With such climate and such a rich soil, almost anything conceivable will grow.

Mineral Wealth—The principal river of the department of Olancho is the Patuca, in its upper reaches known as the Guayape. It has been known ever since Spanish colonial days that this river is gold bearing, but for the most part in its lower reaches there is too much gravel mixed with the gold to make dredging profitable. The story changes, however, as you go up the river and its tributaries, into those regions marked "unexplored" on the accompanying map. The Jalan, a tributary of the Guayape, is comparatively steep and filled with heavy boulders. While for centuries the natives have washed gold on the upper Jalan, problems presented by boulders have so far prevented any important mechanical installations. On the upper Guayape, however, in two of its important tributaries, the Rio Frio and the Platanares, there is, to my mind, one of the best opportunities for dredging profitably that I have seen in many years.

Wide bars containing millions of yards of relatively small gravel, requiring little clearing, occur for many miles along both of these rivers. The gravels appear to be from 30 to 60 ft. deep, and pan on the surface almost

everywhere. We attempted to put one hole to bedrock, but had to quit after running below our caisson at 19 ft. The gold to this depth, however, averaged 50c. per yard. These bars, filled with quartz gravel, extend for 10 to 12 miles along the Platanares, and for over 15 miles on the Rio Frio.

The erosion cycle on both of these rivers is interesting. Apparently the matrix of the gold-bearing formation consists of high hills on either side, of shattered schists and quartzites which are literally cut to pieces with quartz ledges and stringers. The torrential erosion has carried subangular fragments down the mountain sides and built up hills of stiff conglomerate which have subsequently been eroded by the rivers and been reconcentrated into these wide bars of subangular, relatively small gravel. Few stones are much larger than a man's head or trunk, and most of the gravel is fine and running.

While the grade of both of these rivers is relatively light, a steep canyon lies below their junction which would afford an excellent source of year round power. At its lowest, the Platanares will flow about a thousand inches of water, and the Frio about the same. During the rainy season, this will run up to twenty or thirty thousand inches, but only for short periods of time.

The country rock is for the most part a granodiorite, varying with metamorphics such as quartzite and schist, with occasional diabase and porphyritic intrusions. The main source of the placer gold is the infinite series of quartz ledges and stringers which cut more or less at right angles across the rivers, thus making a bedrock which is an ideal riffle for catching gold, and one which is easily dug. Some of these ledges are quite large, running up to 50 ft. in width, but I am convinced that the gold content is very spotty, running to pockets, as in Sierra County, Calif. The history of the country bears this out, as it is a continuous story of pockets ranging in value from five dollars up to fifty thousand dollars. There is little or no history of sustained quartz operations. Such a country, however, does make an excellent field for placer operations, as the history of California placer fields has proved.

Continuing easterly from the Platanares, an entirely different condition is presented by the Danto and Las Marias rivers. Here the bars are of such shallow depth, 10 to 15 ft., as to be readily handled by the natives, and for centuries it has been a paradise for the hand worker with his batea.

Three Periods of Erosion—There are evidences of three periods of erosion in these gravels, in three distinct series of bars. The tilting of the formation is quite recent, and there is at least one volcanic cone in the vicinity which has been active in the memory of man. The usual series in these bars is as follows: First, a top soil and silt overburden of from 7 to 10 ft. Underneath this, a blue-clay seal, called petate, which covers the gold-bearing gravels. Then from one to three or four feet of fairly well-rounded gravel which carries its best values close to bedrock and in the fissures of the bedrock. The gold is heavy and easy to save. It would be ideal for such jigs as the Peterson or Pan-American, or any of the modern jigs used in California placer mining. Its average fineness is well over 900. There are many hundred thousand yards of gravel here which test over a dollar a yard from the surface to bedrock.

On the lower bars is a modern retrenched channel which is about 30 ft. in width. This is a gray sand channel and has cut out the old blue-clay channel completely in some places, comparatively wrecking relative values. Its extent is relatively small, however, compared to the size of the bars. That it is a modern channel is evidenced by the fact that we found old fragments of Spanish pottery in it at a depth of 7 or 8 ft.

Labor and Supplies—For transportation of heavy loads and passengers I would not recommend the building of expensive roads, which are difficult to maintain during the rainy season. A caterpillar with blade can smooth out and cut corners; and the grades are in general so light on the principal trails that a truck with caterpillar traction on the rear end will travel almost anywhere at any season of the year. For the steeper quebradas a few inexpensive timber bridges could be put in, and the timber and heavy logs are there at hand. A bridge is now being put across the Guayape, the only river which presents any problem in Olancho.

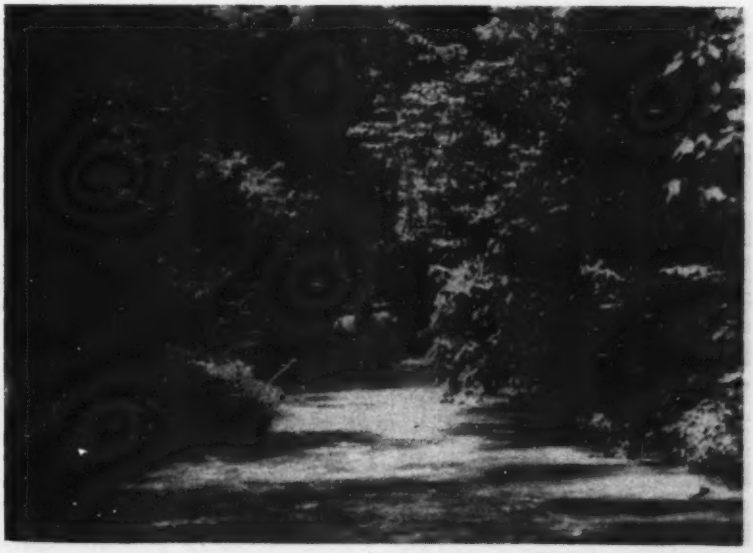
The labor situation is excellent. For from 50¢ to 75¢ a day, you can get men who will work cheerfully and hard for eight hours a day. I have always been accustomed to place the Quichua and Aymara, in Peru and Bolivia, at the bottom of the Latin-American labor scale, with the Chilean Ataceman and the Colombian Antoqueno at the top—but am forced to yield first place now to the Hondurans.

It is essential when out in the interior to carry a simple drug kit and be prepared to doctor all minor infirmities. These people expect it of the "patron" and lean upon him. Iodine and lysol, a few snake-bite remedies, alcohol, carbolic salve, aconite, nux vomica and belladonna pills, quinine combinations, aspirin and digitalis, together with bandages and tape, are all that are necessary, and will add greatly to the efficiency and comfort of your labor.

Gasoline and distillate prices are necessarily high in a region with poor transportation. Some of the operating mines are taking advantage of the resinous content of the forests to put in wood distillation plants for the manufacture of electric power. A firm in Tegucigalpa will manufacture a producer plant capable of running a 250-hp. generator for about $6,000. In many places there is available ample water supply for hydro-electric installation.

South of Olancho and extending on into the Paraiso district, there is mountainous country, well mineralized. Around Danli is a country well worth prospecting. Antimony, quicksilver, lead, silver, and copper are found in

Along the Las Marias, below discovery



this region. In the province of Tegucigalpa are many of the old mines once operated by the Spaniards, and by natives even earlier. Some of these properties are operating today.

Government—The Government of Honduras has always been more stable than most, and the record with regard to foreign concessions is excellent. They are seldom revoked by a change of party in power. The present government is headed by a strong man who has risen from the ranks. President Carias is friendly to Americans, able, and progressive. He might be called a dictator of the type of Porfirio Diaz, except that he is more interested in raising the living standards of his people than was the Mexican president. He has followed a most enlightened policy as to taxation, and has greatly increased the efficiency of the government. For instance, gold miners can take all of the gold produced out of the country, and are taxed only 5 percent of their net. Equipment for use in the mines is admitted duty free; but not for sale purposes.

Living Standards—The living standards are above the average for those Latin American countries with which I am acquainted. The variety of food is excellent. Rice, chicken, turkey, pork, beef, tropical vegetables and fruits, beans, flour, coconuts, fried bananas are common articles of diet. There are few potatoes in the interior, but yucca makes a good substitute. Sugar and salt are native made, and almost every family has its patch of corn and of sugar cane.

A comfortable four- or five-room house can be built with mud or dobe walls and tile roof for about 600 lempira (about $300 gold). Add screen doors and porches, sanitary conveniences such as shower and septic tanks (the house should of course be built on top of a hill for drainage), and include a small gas-driven electric set for light and running a refrigerator, and for not much over $1,000 gold one can be as comfortable in this wonderful climate as in any part of California.

It is, however, always advisable to secure typhoid and paratyphoid shots before coming down, as in travel one can't be too sure of sanitation, particularly with regard to water. While there is some malaria in the lower country, it is avoidable in the mountains by making sure that there are no standing pools of water.

El Rusio and Vijao Districts—I have selected these two districts as typical of the gold country of Olancho. Both are on the limits of explored country. South of them lies a vast territory which is practically uninhabited and unexplored.

The former derives its name from an old Spanish word signifying "shining" or "spangles," referring to early gold discoveries. Many pockets have been taken out, notably by an American prospector named Bell, in the last century, in the Quebrada Grande. This is the main drainage of the district, and runs into the Guayape, although El Rusio itself drains into the headwaters of the Danto.

Most of the veins of this district are characteristic granodiorite, small and exceedingly spotty. Holmes Ives opened up one some few years ago, on the strength of native stories as to its tremendous values, but found the general average too low for practicable working. Mr. Evaline has also done considerable work in the district, with negative results.

Both Vijao and El Rusio are distinctive in that they are located on "vegas," or open, rolling plains. There are few of these on the upper streams of Olancho. The Rio Frio, Platanares, Las Marias, and Danto rivers are the only ones with gentle enough grade to admit of the formation of wide bars on which gold has been deposited in quantity.

Vijao is also on the headwaters of the Danto, and is headquarters for native gold washers, who make all their ready cash in this way. Most of the gold from this district finds its way to Juticalpa, capital of the province of Olancho.

As the natives will not attempt to wash anything running less than a gram to the yard, about one dollar gold, the fact that they have worked here for generations speaks well for the bars of the Danto and Las Marias. As stated before, the shallow depth of these bars, averaging about 10 to 12 ft., of which the bottom 3 or 4 ft. is good pay gravel, makes them more attractive to the natives. The deeper bars of the lower Platanares and the Rio Frio are too deep to be handled by anything other than a bucket line California type dredge. The Platanares, Rio Frio and their tributaries are about the only rivers in this part of Olancho which have formed bars, as the Jalan, while gold bearing, is very steep in grade and filled with heavy wash.

Undoubtedly this particular region has been responsible for the gold which appears in finely divided condition on the bars of the lower Guayape and Patuca rivers. To the south of this region, marked "unexplored" on the accompanying map, there is probably good virgin territory. It is practically uninhabited by natives. The best information that I could get by conversing with them was that in the dry season an occasional native goes south of the Jalan for a few miles because there is both gold and water to wash with; also that tapirs and deer are abundant for food. As good washing conditions are also found nearer home, at Vijao, the natives as a whole do not attempt to go farther. However, the same source of placer enrichment extends both south and east—the belt of gold-bearing quartz stringers which is cut by the Frio, Platanares, and their tributaries for many miles—so it is quite possible that this unexplored region may be as productive of good gold placers as these rivers seem to be.

It is probable that, due to its accessibility and to its many advantages for cheap working, as well as for the high gold content of its bars, the area in the region of Vijao will soon be the scene of considerable activity, both for gold dredging in the deeper ground and for mechanical handling with draglines on the shallow bars of the Danto and Las Marias.

Tests on the lower Platanares indicate values of 40 to 50¢ from surface to a point 10 or 15 ft. above bedrock. No holes were carried deeper than this. No work other than panning was done on the still deeper bars of the Frio, but in one place a native hydraulic operation produced over $40,000 from a few hundred square feet of bedrock. If the gold content of these bars holds up, there is here an opportunity for the largest gold dredging field discovered since Hammonton and Oroville, in California.

Summary—Here is a country, readily accessible, friendly and livable in every respect, whose resources for farming, stock-raising, mining, and manufacturing are as yet untouched. It more nearly resembles California in its virgin days than any other Central American country. Modern methods of mining and farming, with a people ready and willing to learn, can revolutionize the country in a few years and produce untold wealth. Comfortable habitation is possible in a climate which is unexcelled for working during most of the year. Transportation is being solved by new roads, and communications anywhere in the country are now solved by aviation. The use of trucks with caterpillar rear traction will take you almost anywhere in the mountains with a minimum of road construction.

The government is progressive and highly favorable to Americans. Taxation is low and far more favorable than in any other Latin-American country. It is not a tropical country, and the growth in the mining districts is not in any sense jungle. Ground can be cleared in most of the placer districts for not over two cents per yard and in most cases for less than one cent.

The province of Olancho offers better opportunities for placer mining than for quartz. It is, in my opinion, a country with a magnificant future, and a pioneer frontier within easy reach of the United States. Honduras itself is the best and last of the frontiers, close at hand, and waits only the touch of American energy and capital to pay rich dividends.

Mine Pumping Plant Electrified at Rosiclare Fluorspar Property

Installation of 1,600 hp. serves four motor-driven pumps, equal to any emergency—Reliability and low maintenance were objectives of plan

J. H. Edwards
Electrical Editor

INSTALLATION of turbine and centrifugal pumping units with motor drives totaling 1,600 connected horsepower to dewater the flooded 50-year-old Rosiclare shaft, so it could resume production, has meant a busy time during the past two years for officials, electricians, and mechanics of the Rosiclare Lead & Fluorspar Mining Co., Rosiclare, Ill. That company, which operates its own mines and a mill and flotation plant in Rosiclare, produces 200 tons of finished fluorspar per day and holds a place as the largest single producer of fluorspar in the world.

In addition to the Rosiclare mine, the company operates a large mine on the Daisy vein, and one on the Blue Diggings vein, each 800 ft. deep and about 4,000 ft. long, and also six smaller mines near Rosiclare. Across the Ohio River in Crittenden County, Ky., it has in production some mines in the Tabb vein.

The Rosiclare shaft, when flooded in 1924 to within 75 ft. of the top by an underground stream encountered on the 612-ft. level, was 700 ft. deep and stands at that depth at present. One of the pumps is a deep-well turbine type with the motor at the surface, but the other four are horizontal centrifugals installed in a permanent station on the 612-ft. level, where power at 2,200 v. is delivered by a large steel-armored cable.

For this pumping job all of the items of electrical and mechanical equipment were purchased new and the installations were planned and carried out with dependability, long life, and low maintenance as the prime considerations. Gas and electric arc welding were used in assembling a 12-in. column pipe for the discharge of the permanent station.

Rosiclare shaft is at the company's mill, which is one-half mile north of the Ohio River in a locality 90 miles up that river from its confluence with the Mississippi. The mining is in a 2- to 20-ft. fault fissure vein 6,000 ft. long which is practically vertical and the depth of which is surmised to exceed the present limits of practicable mining.

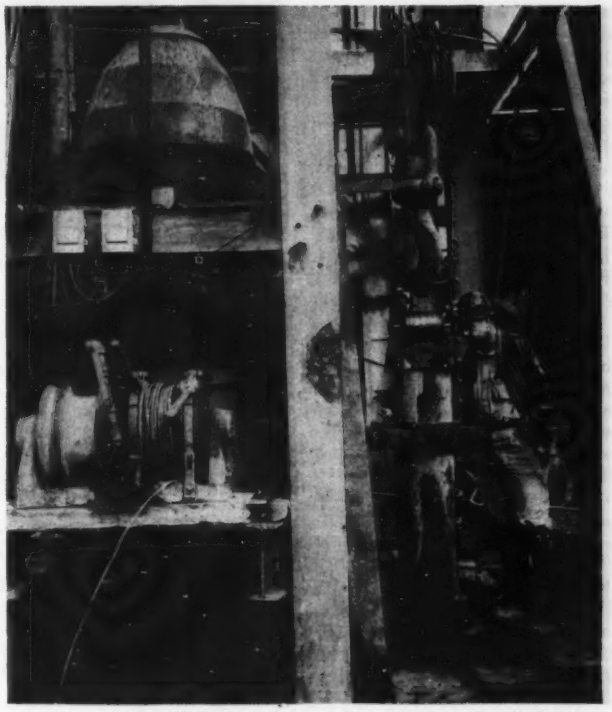


Fig. 1 . . . Rodney McClusky, mining engineer, inspects the plumb wire in the discharge pipe being installed for the 4,000-gal., 700-ft. head pumping station. The 600-hp. turbine pump at the left is temporarily in one hoisting compartment

At this Rosiclare mine the auxiliary shaft for ventilation and for handling men and supplies is 535 ft. south of the main hoisting shaft and mill. The main shaft has two compartments and one of them has been in continual use through the years to hoist into the mill the ore hauled by rail and truck from the other mines, and which is dumped in a track hopper converging to a shaft pocket 30 ft. below the surface.

For assurance against breakdown and to provide for handling a much larger quantity of water in case of emergency, it was decided to install pumping facilities at both shafts. The plan adopted was to buy a deep-well turbine pump, to be installed in one hoisting compartment, for the original pumping out job, then after the installation of a permanent pumping station on the 612-ft. level, move the turbine pump to a permanent set-up in the auxiliary shaft. Lowering the water level, which stood 75 ft. from the surface, was started in July, 1940, with a Pomona 3,200-g.p.m. water-lubricated pump driven by a Westinghouse 600-hp. 2,300-v. motor operating at 1,160 r.p.m. The lowest bowl of the 18-stage bottom unit was positioned 640 ft. below the surface discharge. In Fig. 1 the motor of that pump stands at the left and to the rear of the small hoist of temporary mounting for installing the column pipe (right-hand of view) for the permanent underground station.

Of the total weight, 94,000 lb., of this Pomona pump, 83,000 lb. are suspended. The 16-in. column pipe was assembled in 10-ft. lengths. The bowls are 18 in. in diameter and the drive shaft is 3 7/8 in. The former are cast iron, impellers are red bronze, the drive shaft is steel, its journal sleeves are monel, and the bearing bushings, rubber. Appearing at the left in Fig. 2, presented at bottom left, below, from a photograph made on the 612-ft. level, is the top end of the bowl section.

Sixty days were required to drain the mine to the 612-ft. level and make it accessible for rehabilitation and the installation of centrifugal pumps to replace the old steam pumps which proved inadequate during the emergency of 1924 and had been submerged ever since.

Fig. 4 is a construction view of the four 1,000-g.p.m. two-stage centrifugals manufactured by the Cameron Pump Division, Ingersoll-Rand Co. These are No. 4 Type-GT units rated 700 ft. total head at 3,560 r.p.m. Each is driven by a General Electric Type-FT 250-hp. 2,200-v. drip-proof motor. In each 6-in. discharge from pump to header is a Chapman 6-in. check valve and a Crane 6-in. gate. And in the finished job there is a Chapman 8-in. check valve in each suction. Motors are connected to the pumps by Fasts couplings made by the Bartlett Hayward Division, Koppers Company.

Two of the pumps are started by automatic compensators with float-switch control and the other two by manually operated compensators, all made by the General Electric Co. The view Fig. 5 shows a compensator and three motors as stored in the mine power plant ready to be lowered into the shaft. The compensator in that view, a manually operated type—CR1034—has been fastened into a wooden cage built specially for the lowering job. It has bolt-assembled guide channels, so was convenient to install temporarily in place of the self-dumping skip normally operating in the shaft. That method of lowering the compensators avoided taking chances on bumping the rock walls, which might have happened if the compensators were suspended free on the rope.

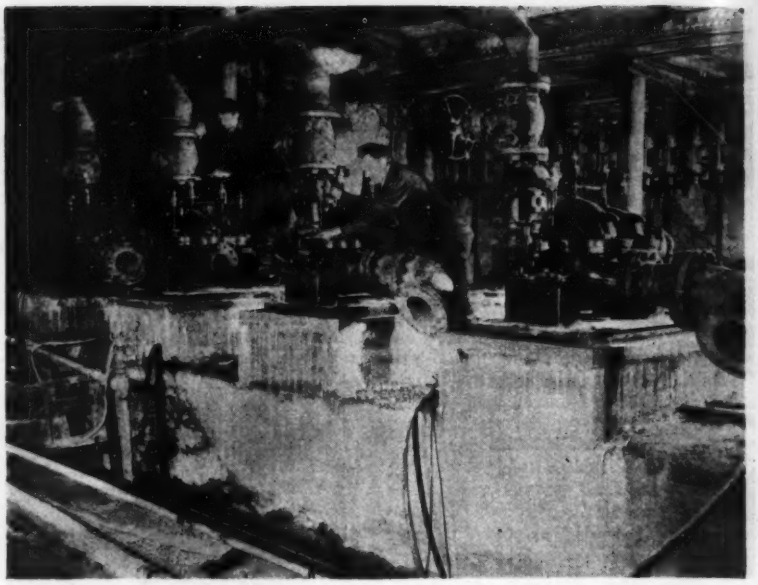


Fig. 4 . . . Installing the four new 1,000-g.p.m., 700-ft. head, motor-driven centrifugals. Clifford Carlisle (left) and Albert Layne on the job

Eighteen General Electric disconnect switches, Type-FA101, 400-amp., with silver contacts and insulated for 7,500 v., were being installed in the pumping station when the construction view of Fig. 6 was made. In addition to the four circuits to the 250-hp. pump motors, the switches feed three new 75-kva. General Electric Type-H transformers (220/440 v. secondary) installed in a corner of the pumping station to supply 440 v. to a 40-hp. hoist, to mine ventilation blowers, to motor-generator sets for locomotive battery charging, and to furnish the 220-v. power for mine lighting. Levels on which locomotives will work will extend 4,000 ft. north and 2,000 ft. south.

Terminals of the shaft feed cable are tied directly to the buses which extend back of the pumping station disconnects. The total cable length from power plant distribution board to underground buses is 700 ft. This cable, made by The Okonite Co., has

Fig. 2 . . . At the 612-ft. level Albert Layne, of the construction force, obligingly stands back of the turbine pump working barrel to indicate relative size

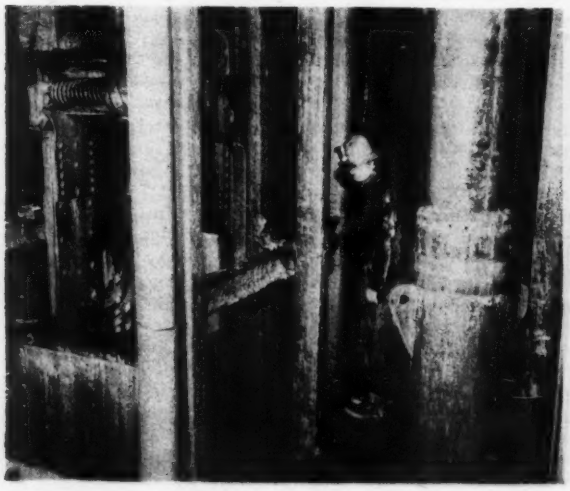


Fig. 3 . . . The turbine pump unwatered the mine at a rate exceeding 4,000,000 gal. per day

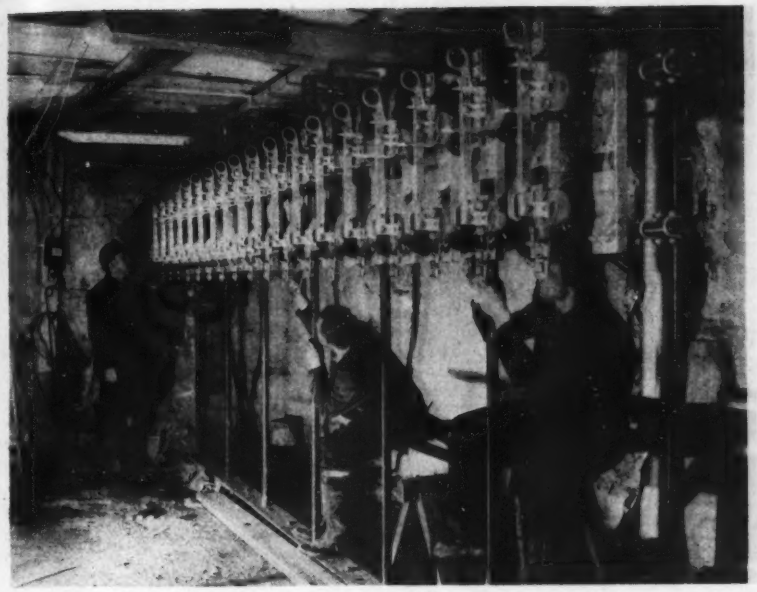


Fig. 6 . . . Percy Howard, chief electrician (left), inspects the 18 silver contact disconnects during installation in the pumping station

three 350,000-circ.mil conductors and is the steel-wire armored type without lead sheath. Other specifications read: ¼-in. wall of Okalite, 4/64-in. belt of Okoprene, cabled tobether, double-wrapped tape, layer saturated jute, No. 6 B.w.g. armor wire.

From both north and south sides the 612-ft. level drains to the hoisting shaft. The new plan calls for regrading from this shaft south 535 ft. to the auxiliary shaft, so that the water from the underground stream can be diverted if necessary around the hoisting shaft and to the auxiliary shaft, where the 3,200-g.p.m. deep-well turbine pump is scheduled for permanent installation. This shaft was recently deepened 50 ft. (below the 612-ft. level) to provide a sump for this turbine pump.

A new 600-ft. discharge column installed to operate in parallel with an existing 8-in. line in the cable and pipe compartment of the main shaft is 12-in. double-strength assembled with the 18- to 29-ft. sections gas welded. Figs. 1, 7, and 8 show steps during installation of this pipe. Two men worked simultaneously on opposite sides when welding the pipe joints. Hanger and anchoring eyebolts at each joint were attached by arc weld. A No. 18 gage tinned-steel wire placed in the center of the pipe served as a plumb to align and check details of the job.

At a later date an effort will be made to stem by grouting or other means the excessive flow of water into the mine. If successful, the pumping plants will of course be relieved of the continual duty but will stand as insurance against flooding by encountering another water feeder.

This pumping installation for Rosiclare shaft is intimately tied in with two other completed projects, a new power plant and a froth flotation plant. To accommodate the extra pumping load, the generating capacity was increased from 750 kw. of non-condensing engine-generators to 2,250 kw. of condensing turbo-generators. The mine water is discharged directly through the surface condensers and this warmed water is then used to advantage in the flotation plant. The new power house and flotation plant are described in separate articles to be published later.

To complete the company's pumping picture, it is necessary to mention that at its South Boundary shaft, 1,600 ft. from the Rosiclare hoisting shaft, it operates a 500-g.p.m. centrifugal pump on the 140-ft. level to handle water filtering in from the adjoining workings of another company.

Those most closely concerned with the engineering or construction of the drainage project are: A. H. Cronk, superintendent; Rodney McClusky, mining engineer; K. P. Jackson, master mechanic; Percy Howard, chief electrician; and Victor Young, general mine foreman. Incidentally Mr. Howard is mayor of the town of Rosiclare, a responsibility he has had for the past eight years.

Fig. 5 . . . Compensator fastened into a special cage ready for lowering through the hoisting shaft. Included in the view, and also to go underground, are three of the four new 250-hp. drip-proof motors and one of the new 75-kva. transformers

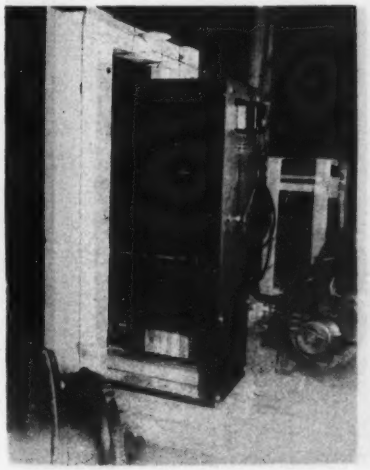


Fig. 7 . . . Ruby Winters (left) and Fred Jackson weld simultaneously on opposite sides of the 12-in. column pipe

Fig. 8 . . . Hanger eyes at each joint were attached by arcweld

Ore Transport at Wakefield Mine

When the pit, with high banks and a narrow bottom, became too deep for standard steam haulage, Differential equipment was substituted with gratifying results in cleaning up. In five shipping seasons three eight-car trains of this type have handled a total of 1,080,000 tons at a cost of 3.5 mills per ton for maintenance

R. B. Wortley

Superintendent,
Wakefield Iron Co.
Wakefield, Mich.

THE WAKEFIELD MINE is situated within the limits of the city of Wakefield, on the Gogebic iron range, in northern Michigan. This mine was first opened in 1914 by the Wakefield Iron Co., a subsidiary of the M. A. Hanna Co., and was operated as an open pit until 1933. The pit is approximately three-quarters of a mile long with an average width of about 600 ft., running east and west. Entrance into the pit was accomplished by means of a series of standard-gage switchback tracks on benches on the north side, the last switchback being on ore benches. A 3 percent grade was used in laying out the track benches.

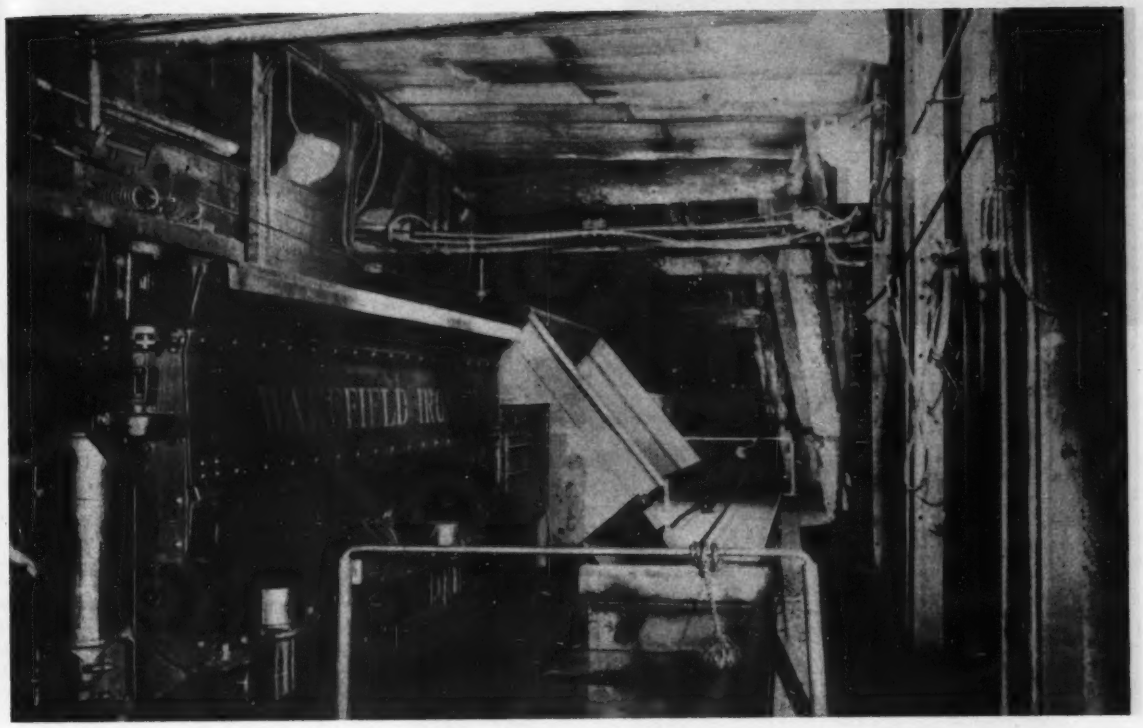
Mining equipment consisted for the most part of the standard railroad-type steam shovels which loaded the ore into 50-ton railroad cars. These were hauled to the railroad yards by standard-gage locomotives of approximately 80 tons' weight and at this point were made up into trains which were hauled to the docks at Ashland, Wis., by the Chicago & North Western Railroad.

During the early years of the mine's operation a five-compartment shaft was sunk to a depth of approximately 450 ft. This was about 800 ft. southeast of the open-pit area, in the footwall. It was used to explore other areas of the property by underground drifting and to accommodate the drainage from the open pit. For drainage purposes a pump room and sump were constructed near the bottom of the shaft. The pumping equipment consisted of one plunger-type pump and three centrifugal pumps, all electrically driven, with a combined capacity of about 4,000 g.p.m. To collect the water a drift was driven below the level of the pit in the footwall side, and from this at various intervals crosscuts were driven north to points under the pit. From the bottom of the pit 6-in. holes were put down with a churn drill to the crosscuts through which drainage water from the pit started on its course to the pump sump.

By the year 1933 the bottom of the pit had become so narrow and deep that it was necessary to abandon the standard-gage haulage system. To remove the ore left under the track benches, it was decided to use an 80-B Bucyrus electric shovel. An 8x12-ft. drift was driven from the shaft to the east end of the pit at the elevation of the pit bottom for haulage purposes. Equipment comprising 21 cars and three electric locomotives was purchased from the Differential Steel Car Co., Findlay, Ohio. A special feature of these locomotives is that a car box of the same capacity as the cars is mounted on the locomotive, so that the company obtained three trains of eight cars each by purchasing the 24 pieces of equipment.

Each car comprises three separate parts, two sets of wheels and axles being mounted by the use of shackles and springs on a frame of angle iron upon which the flat bottomed box is

Loading a Differential train in the Wakefield pit, a dipperful to a car



A train that has been loaded in the pit dumping the ore into the underground shaft pocket to be hoisted to the surface

mounted. The box has a capacity of 76 cu.ft., and moreover has a flat bottom, so that every inch of space is used for the load. The sides compose the doors of the box and are fastened to its end by links connected to the ends and bottom sides of the door in such a manner that when the car is dumped the door folds out and down and when the box is in a dumped position, the door lies in the same plane as the bottom of the car, thereby affording an unrestricted flow of the contents. Car wheels have roller bearings and are cast of special steel. The cars are equipped with three-quarter size railroad couplers with safety chains and hooks but have no brakes, for the reason that the locomotive furnishes the braking power for the seven-car train. These cars were made by using the standard Differential 50-cu.ft. car and adding a 10-in. sideboard to the sides of the box, so that the capacity was increased to 76 cu.ft. as required for this operation. By removing the side boards these cars can be used in any underground mine that has a 36-in. gage track.

The cars are dumped by using an air-operated jack placed on the shaft side of the track at the shaft pocket. This jack has an up-and-down motion and is mounted on a shaft so that it can be moved under the car to be dumped and back again out of the way of dumping. After spotting the car the jack is swung under the side of the box and the air lifts one side of the box only, thereby dumping the car, as previously described. By reversing the operation the box is brought back into place and the jack is swung back in the clear for spotting the next car.

The locomotive with the car-box mounted on it is about 18 ft. long and weighs 12 tons. A shelter for the operator, or cab, is at one end of the control contactors and sand boxes are at the other end, with the dump box in the center. The box on the locomotive is dumped by the motorman by means of air cylinders mounted under each side of the box. The locomotive has two sets of 33-in. wheels and axles which are geared to two 33-hp., 250-v., d.c. motors. It is also equipped with a small air compressor which furnishes air for operating the brakes and the sanding and electric-current-collecting devices. As in the cars, these locomotives were so designed that by removing the box and cab they can be used for underground haulage.

This equipment was used during the shipping season for the five years 1934 to 1938 inclusive, during which time it hauled 1,080,000 tons of iron ore from the pit to the shaft. The average length of haul was approximately 2,500 ft. on track grades that averaged about 3½ percent. At times it was necessary to operate for short distances on grades as high as 6 percent. As the cars were loaded by a shovel dipper of the same capacity, each took its load almost instantly. At times, when the shovel was in a deep cut, the cars received considerable abuse by being struck by the dipper door.

Parts in these cars that had to be replaced were few, consisting of very small springs in the dumping link, truck springs, and shackles which were broken in bad derailments. Six spare wheels were purchased with the original equipment and were used as replacements when the worn wheels were taken to the mine shops to have the flanges built up with hard facing rods for further service. The total cost of these supplies did not exceed $450.

The parts requiring replacement in the locomotives consisted mostly of truck springs, brake shoes, and electrical parts, the largest item being a new set of control contactors to replace a set that had become overheated and burned. The cost did not exceed $700.

Labor charges for maintenance of both cars and locomotives amounted to $2,600, making a total maintenance cost of about $3,750, or a per-ton cost of 3½ mills.

Considering the hard usage these cars received on this job, and their present good condition for future underground work, we feel this equipment has served our purposes very well.

Fig. 2 . . . Moving sled under boat

Moving a 2,000-Yd. Dragline Dredge Across a Paved Highway

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THIS BOAT was put in operation on Agua Fria Creek, Mariposa County, Calif., in 1939. It is owned by the Trebor Corp., of which Robert D. Mueller is president, and is operated by Charles R. and Lucian W. Smith, Jr.

The gravel deposit or "bar" is crossed, near its lower end, by a paved highway on a concrete bridge with a 10-ft.-high embankment at each end. Enough gravel remained below the bridge to yield a satisfactory profit if getting the boat across the highway could be done at a low enough cost.

Dredging a new channel around one end of the bridge with a detour for traffic and a strip of new pavement to lay was prohibitive. Dismantling the boat and reassembling it in its new location would take eight days and cost $1,500. Bids received from machinery and trucking companies were from $1,800 to $2,000. After consulting with some of the lumbering concerns handling heavy logs and logging machinery, the Trebor crew decided that it could be done cheaply and quickly if a permit could be obtained to close the highway for a few hours. This permit was granted, the road to be closed from 1 to 7 a.m. Jan. 27, 1940.

The plan was to build a "cradle" or "sled" under the boat while it was still afloat in the old pond. (A new pond had been dug below the bridge, and a road cleared and smoothed between the two ponds.)

The sled was made of two 50-ft. logs, about 30 in. in diameter, to act as "runners." They were tied to cross longs at bow and stern by ¾-in. cable pulled tight by the tractor, after which the sled was lifted at the front end high enough to start it under the boat and pushed under the boat by the tractor while the boat was still in the pond. This was done without difficulty.

When the problem was first under discussion it was thought the boat on its sled could best be moved on rollers, but an investigation showed it would be much cheaper using the sled alone on the ground. Planking of 3-in. planks well greased on their upper surface was laid crosswise in the line of travel over the highway to protect the highway surface. This proved entirely satisfactory.

Whether the dragline machine would prove strong enough to pull the 60 tons of boat, plus about 10 tons of sled, up the hill from the pond to the pavement, was a serious question, depending largely on the rope hook-up used. The arrangement adopted is what is known as "The Woodsman's Luff," and is illustrated in the accompanying sketch.

There was no trouble with this arrangement at any time. A 1-in. steel cable or rope was already in use on the job, so that the two pulleys were the only things to provide. There is no reason why heavy blocks and tackle should not be used, but none were available in this case and the "luff" answered every purpose.

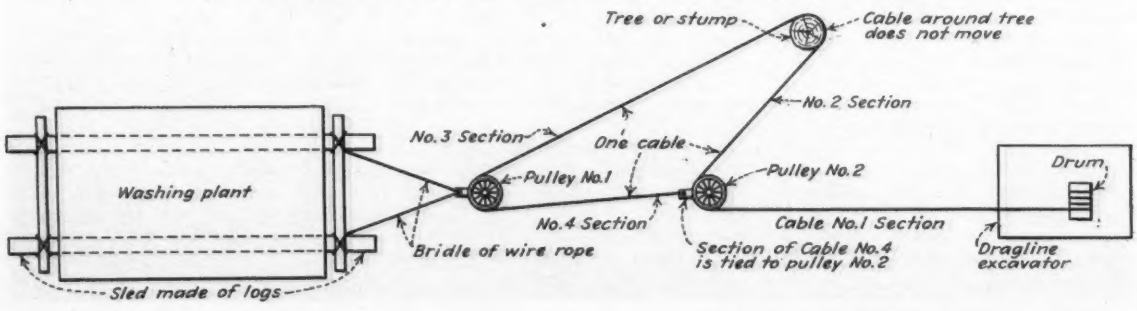
Each "pull" or "hitch" by the dragline netted about 6 ft., when the pulleys had to be reset. The first hitch was made at 1 a.m. and the plant was in the new pond at 7 a.m. as planned. It was overhauled for a few minor changes but went into production at midnight the same day. The entire cost was about $200. It can be done for less than that because, not knowing what might develop in a first trial, all three shifts were held on the job.

No damage of any sort was done to the highway, pavement, or bridge, nor was there any delay to traffic.

There was a gallery of about 200 spectators, many of them frankly skeptical, expecting to see some young engineers fall down.

This history is published not so much to help dredge operators cross highways as to show a cheap and quick method of getting a boat across a tough stretch of hard or ragged bedrock, or over an intervening strip or piece of ground not to be dredged.

Fig. 1 . . . "Woodsman's Luff." Rope hook-up used to pull boat and sled out of the water



Refining a Low-Grade High-Copper Gold Precipitate

A procedure for treatment plants of medium size, particularly in isolated foreign districts

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▶IN RECENT YEARS *the cyanide process has been applied to the recovery of gold from materials that contain large amounts of cyanicides or base metals that dissolve with gold and silver. This condition has become more general since flotation has become an important auxiliary process in cyanide treatment, either to concentrate cyanide feed or to remove cyanicides before treatment. A portion of these metals appear in the precipitate recovered from solution, and they must be eliminated partially or completely before the bullion is marketed. Ordinarily the bullion is only partly refined at the mine, but in some instances large producers find it profitable to ship fine bullion. The degree of refining before shipment must depend on local costs. The following article is a description of the refining of an unusually impure gold precipitate and a brief summary of general methods of refining.*

Stand for pouring bullion from the crucible into the mold

CONDITIONS under which the bullion was sold were very unusual at the ore-treatment plant where the refining of gold bullion, as here described, was conducted. A local dealer purchased the entire mine output and refined the bullion by inquartation and acid-parting. A unique part of the arrangement was that settlement was made on the basis of the mine assay; the dealer had no means of checking the gold content of a shipment other than by the weight of refined gold recovered, and no local custom assayers were available for umpire checking. To obtain an accurate bullion sample, and to relieve the buyer of the extra expense involved in refining low-grade bullion, it was necessary to devise a method of refining the precipitate as easily and cheaply as possible with the available equipment. It was possible to check assays made of the bullion when it contained between 700 and 800 parts of gold per 1,000, and the refining practice was designed to hold the fineness near the upper limit of this range. The silver content, which amounted to about 40 parts per 1,000, was not considered, because no payment was received for this metal.

Acid treatment of the precipitate was not attempted, principally because equipment for doing the work did not exist. Preliminary roasting was first tried and a furnace was built to hold heavy cast-iron trays which were heated from below by an oil fire. The trays were butted closely together so that there was no draft over the surface of the precipitate, and close-fitting cast-iron tops were mounted on the furnace walls over the trays. This construction approximated that of a muffle furnace. Roasting did not prove successful as a refining step. A short description, however, may interest some operators.

Roasting-refining — The precipitate was dried with the furnace tops removed until steaming was at a minimum. At this point the tops were placed over the trays and the furnace temperature was increased until the charge was dull red when stirred. The material showed little tendency to dust at this temperature. When the calcine had cooled, the trays were removed and the calcine was screened to break up lumps and fluxed with borax glass and silica in the proportions of about 40 and 25 parts, respectively, per 100 parts of calcine. This combination gave a good slag for pouring and did not attack the crucible unduly. Additional silica was added if the first charge tended to corrode the crucible.

Melting was done with a No. 60 D.F.C. oil-fired tilting furnace having a graphite crucible. The principal trouble was that the charges boiled violently after melting, due to slagging reactions. Some copper was thus oxidized, because the slags were red in color. This disproves the general belief that copper will not oxidize and enter the slag before zinc is eliminated. However, the degree of refining in this case was far from satisfactory. The fineness of bullion varied from 400 to 600 parts of gold per 1,000, and the uncertainty of assay results, together with the messy nature of the treatment in general, resulted in the adoption of another refining scheme.

Pyritic Fluxing—It was known that pyrite in the flux would combine with copper and other base metals to form a matte[1]. Facilities for quickly determining the composition of the precipitate did not exist, and the first use of pyrite was therefore experimental. The flux contained 50 parts of pyrite in addition to the acid fluxes and the bullion assayed 870 parts gold per 1,000. About 40 percent of the original gold entered the matte, however, and the pyrite addition was later reduced to 15 to 20 parts per 100 of precipitate. The resulting bul-

[1] See footnote references at end of article.

lion was lower in grade, but a much better gold recovery was obtained. This flux gave normal, quiet fusions and no trouble was had in obtaining clean separations of slag, matte, and bullion after pouring.

The gold production of the plant consisted of cyanide precipitate and sponge gold from amalgamation. The latter amounted to about 40 percent of the total. As the sponge gold was relatively pure, it was necessary to refine the cyanide gold only partially to obtain the desired fineness for shipping. Had the sponge gold not been available, the most feasible method would have been to use the lower range of pyrite addition and purify the partly refined bullion with sulphur. Actually, this procedure was sometimes necessary, because the variation in base metals present in the precipitate made it difficult to estimate the pyrite addition correctly every time. For this reason, sulphur refining of the primary cyanide bullion is indicated as an optional treatment in the accompanying flowsheet, Fig. 1.

Precipitate Handling and Fluxing—The precipitation plant was a Merrill installation of 20 bags with a rated daily capacity of 60 tons of solution. On clean-up days the bags were blown with low-pressure air for about an hour before they were removed for cleaning. The bulk of the precipitate was shaken into the trays of the former roasting furnace, which was utilized as a drier. The material was dried to 30 per cent moisture, after which it was scooped out, forced through a ¼-in. screen, and fluxed directly. Melting and refining were started at once. As soon as the trays of the dryer were available the inner muslin bags were dried in them, after which they were soaked with kerosene and allowed to burn to ash in a large sheet-iron pan. The ash was allowed to cool quietly and was then thoroughly dampened with water before it was fluxed. This procedure is slightly more expensive than washing the bags for re-use, but the time saved was advantageous to the clean-up routine; also, extra handling and carry-over of gold were avoided. The precipitate was fluxed with 35 parts borax glass, 15 to 20 parts silica, and from 15 to 20 parts pyrite per 100 parts of dry material. The amount of silica and pyrite necessary was estimated from the amount of base metals judged to be present from the color and final weight of the precipitate. This was generally a dirty gray, but grading into black as the gold content increased. The precipitate was always lumpy as it came from the bags.

The dry weight proved to be the best indication for judging the flux, because the actual gold content was always known to within a few ounces from daily solution tonnage measurements and assays.

Many operators prefer to dry precipitate completely before fluxing. This requires more time and the possibility of loss from dusting is increased. Dry material will melt somewhat faster than that which is damp, but usually not enough to regain the time lost in complete drying. This applies of course to small plants where a clean-up can be refined in a single working day, as in this case.

Primary Refining—Ordinary melting procedure was followed in the use of the pyritic flux. The furnace was fired until the slag was hot and fluid; at this point dense fumes of zinc oxide would be evolved, which indicated that refining had reached the desired point. The melt was poured into conical cast-iron slag pots, the tips of which were rounded to facilitate the removal of bullion. The pot was allowed to stand quietly until examination with an iron rod indicated that the surface of the matte which covered the bullion had solidified. The slag was then decanted into a pit in which water was circulated. A perforated cyanide drum in the pit received the slag, which was thus recovered in a granulated form and saved for further treatment. The partially solidified matte and bullion in the pot were then dumped on a cast-iron plate, where the matte was allowed to cool until it was certain that solidification was nearly complete. During this time excess slag was removed from the mass and returned to the melting furnace. Final cooling of the cone of matte and bullion was done in the granulating pit, after which the bullion button would come free. This operation is explained in some detail because considerable patience is required in the cooling. Molten matte and bullion in water will cause dangerous explosions under certain conditions.

Bullion from this refining step was remelted with sponge gold and refined secondary bullion from the previous month's clean-up; this final melt was cast into bars for shipment. Borax glass was used to form a slag cover, and as the buttons from pyrite refining were never completely free from matte, it was necessary to remove the slag and small amount of matter before casting. Drossing was done by sprinkling bone ash over the slag to thicken it, after which the material could be scraped off the surface of the molten bullion. The dross was screened to remove excess bone ash and was later melted with precipitate.

Sampling and Casting—We found that a dip sample from the furnace gave the only reliable means of assaying the bullion, because the residual copper content of the material caused too much segregation in the bars to permit the use of samples obtained with a drill. The bullion was brought to pouring temperature after drossing, and just before casting it was sampled with a preheated graphite spoon. First the melt was mixed thoroughly with the spoon, using an up-and-down as well as a circular motion. The sample consisted of about 5 oz. of bullion, and this was poured immediately into an enameled bucket full of clean water. It was poured from a height of 2 ft. and the wooden spreader sketched in Fig. 2 was effective in producing fine shot that could be weighed directly for assay. The final bullion contained enough base, probably arsenic or lead, to produce shot that could not be rolled into strips for shearing and weighing up assay portions. If the melt had been drossed properly prior to sampling, the shot sample would be clean and fairly bright, but the presence of a small amount of

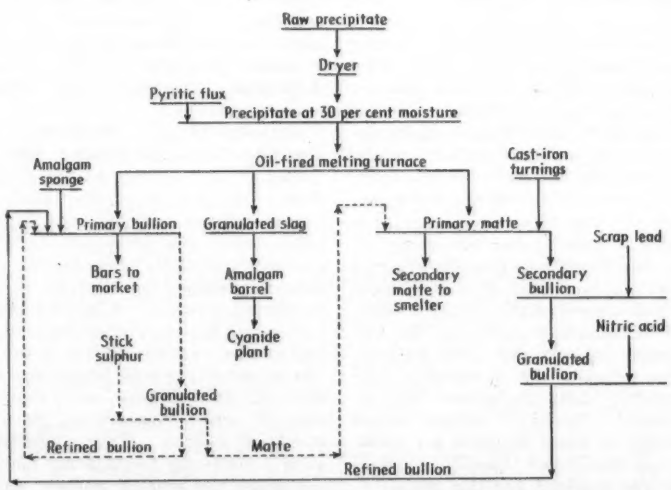

Fig. 1 . . . Flowsheet of precipitate refining by pyritic fluxing. Sulphur refining of the primary bullion is indicated as an optional treatment

matte on the surface of the melt would usually result in dirty shot, the value of which as a sample would be in doubt.

Sampling in this manner is open to the objection that some oxidation of base is certain to take place during pouring, so that the fineness will not be representative. This is true with very base bullion. In this case, however, little oxidation on the "eye" of the sample could be observed before it was poured. The objection due to oxidation is valid, but the bulk of the bullion oxidizes to a similar degree when the bars are cast. Hence it is possible to err in either direction so far as sampling routines are concerned.

Immediately after being sampled the bullion was poured from the furnace into a preheated No. 20 graphite crucible, from which bars were cast in iron molds designed to hold about 600 oz. of fine gold. The pouring stand is shown in the accompanying picture. It is ideal for casting large melts of bullion and is shown primarily for this reason. It is not absolutely essential for the small amounts involved in this operation.

Matte Reduction and Secondary Bullion Refining—The matte produced in the primary refining operation contained about 4 per cent gold. To recover this it was necessary to reduce the matte to bullion of low grade and treat the product with acid to obtain bullion sufficiently fine for inclusion with the next lot of refined metal. The reduction and refining required about two days of intermittent work, which was done during the month as time permitted. All primary matte, including that recovered from sulphur refining, was crushed to pass a ¼-in. screen and melted with 10 per cent of its weight of cast-iron turnings. This material was chosen because it was finely divided and had a relatively low melting point. Iron in any form would have the same effect. The pouring temperature of these melts was somewhat higher than with those used in refining precipitate, but the charge did not attack the crucible. Secondary matte and bullion were poured into slag pots and allowed to cool completely before removal. A button of copper and zinc containing most of the gold in the charge could then be removed from the bottom of the cone. In Table I are listed assays which indicate the recovery percentages from two typical melts of this kind.

It was necessary to remelt and granulate the secondary bullion for acid-parting and at this melting about 5 per cent of its weight of lead was added. The step of granulation gave some trouble at first and the method that was finally adopted was to dip the metal from the furnace in small amounts with a clay crucible and pour into a large tub of water. The operation required some practice, but after

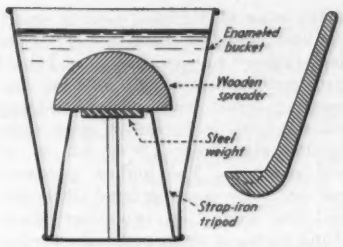

Fig. 2 . . . Device for "shotting" bullion samples. A pair of tongs, not shown, clamp over the handle of the graphite sampling spoon

the knack had been acquired uniform shot could be produced. The first attempts to granulate bullion by pouring an entire melt into a drum of water were unsuccessful because the metal temperature and pouring speed could not be regulated nicely enough to prevent the shot from sticking together in a solid mass.

The granulated bullion contained from 150 to 200 parts of gold per 1,000 and was acid-treated in enameled iron bowls of about two quarts' capacity. Concentrated commercial nitric acid was used and enough heat was generated by the reaction to accomplish the parting. Bullion about 800 fine was produced. From 25 to 40 oz. of metal was placed in each bowl, depending on the violence of the reaction between acid and metal. As soon as the action had ceased completely, the clear, spent acid was decanted, the gold slime was washed out with water into an enameled container, and fresh acid was added to the residue shot. About three additions were required to reduce the shot completely.

A characteristic of this bullion was that of breaking up into slime on parting, and it was advantageous to remove this after each acid addition was spent. It was found that a small lead content in the bullion would cause this slime to settle and permit the decantation of clear solution. It was desirable to segregate this because it was high in copper and would have attacked the iron filter that was used to dewater the slime. An ordinary laboratory-type pressure filter with an 18-in. casing was used for this purpose. The filter cake was melted directly with a small addition of borax glass. Most of the silver in the bullion was dissolved, of course, and on occasion this was recovered from solution by precipitation on scrap copper. As noted previously, the silver was not marketable and the recovery was made only to meet assay office requirements.

Refining Bullion With Sulphur—In the event that the primary bullion from pyritic smelting was too low in fineness, it was refined with stick sulphur. The bullion was first granulated and then packed into a No. 20 crucible with alternate layers of the sulphur. The cold crucible was then put into the pot of the tilting furnace, which had previously been raised to melting temperature. Some of the sulphur burned off immediately, but most of it would

Table I—Primary Matte Reduction, Metal Balances

(1 ton = 2,240 lb.)

Charge	Fine Gold, Oz.	Wt., Lb.
Example A		
56 lb. matte at 1,562 oz./ton	39.1	56 •
6 lb. cast-iron turnings	....	6
	39.1	62
Pour		
42 lb. matte at 54.4 oz./ton	1.0	42
168 oz. bullion, 229 fine	38.5	9.5
	39.5	(a) 51.5
Percent gold recovery =	97.5	
Example B		
Charge		
71 lb. matte at 1,081 oz./ton	34.3	71
7 lb. cast-iron turnings	....	7
	34.3	78
Pour		
63.5 lb. matte at 39.3 oz./ton	1.1	63.5
208 oz. bullion, 191 fine	39.7	11.8
	40.8	(a) 75.3
Percent gold recovery =	97.3	

(a) Apparent melting loss consisted of slag which was not weighed.

$$\text{Percent recovery} = \frac{\text{gold in bullion}}{\text{gold in secondary matte bullion}}$$

Table II — Refining by Sulphur, Metal Balances

Charge	Wt., Oz.	Fine Gold, Oz.	Bullion Fineness
Example A			
Primary precipitate bullion			
Charge			
Bullion	395	254	643
Sulphur	40	...	...
Total	435		
Pour			
Bullion	285	239	839
Matte	129	10	2,550 oz./ton
Total	414	249	
Example B			
Primary precipitate bullion (First refining)			
Charge			
Bullion	64	43.8	685
Sulphur	3	....	...
Total	67		
Pour			
Bullion	50.8	40.2	791
Matte	11	1.2	...
Total	61.8	41.4	
(Second refining)			
Charge			
Bullion	50.8	40.2	791
Sulphur	2.5	....	...
Total	53.3		
Pour			
Bullion	49.4	....	Not sampled
Matte	None	....	...
Total	49.4		
(Third refining)			
Charge			
Bullion	49.4	....	...
Sulphur	5	....	...
Total	54.4		
Pour			
Bullion	49.3	40.5	822
Matte	None	....	...
Total	49.3		
Example C			
Matte bullion			
Charge			
Bullion	268	41.3	154
Sulphur	57	....	...
Total	325		
Pour			
Bullion	67	35.4	520
Matte	246	5.2	695 oz./ton
Total	313	40.6	

react with the bullion. The mass of bullion in the pot would show a dull red color before the container reached a visible color which indicated that reaction had taken place below the melting point of the metal. The small crucible was lifted from the furnace as soon as the melt was hot enough for pouring. The matte cover separated easily from the refined bullion when the mass had cooled to room temperature.

Table II shows assays and metal balances of refining on various grades of bullion. The upper limit of refining by this method seemed to be something in excess of 800 parts of gold per 1,000. Apparently some compound of gold and copper was not attacked by sulphur. Zinc and other metals were of course always present in the charges, and the real reasons for the failure of sulphur to react after a certain point cannot be assigned. The use of sulphur refining on secondary bullion from matte reduction was not adopted as a practice, because it was desirable to keep down the circulating load of high-grade matte. Fire refining with sulphur was less "messy" than parting with acid, however.

Slag Treatment—Slags from precipitate refining were erratic and high in value. In the first months of experimenting with the precipitate it was necessary to remelt some slags to recover bullion. The production of low-grade slags is somewhat of a problem and the relative fluidity of slags when molten seems to have no apparent relation to their cleanness. Weinig[2] states that a ratio of 2 to 1, acid oxygen to basic oxygen, in the mixture of flux and precipitate, will produce a consistently low-grade slag. Woodworth[3] reports low-grade slags that are evidently higher in basic oxygen than this, although it is impossible to calculate the ratio from the data given. In both cases cited, clay or clay-lined crucibles were used and the slags assayed from 1.0 to 1.5 oz. of gold per ton.

The type of furnace used in smelting also seems to have a bearing on slag values. In two instances I have used reverberatory-type oil-fired furnaces in direct smelting and refining and consistently produced slags ranging in value from 1.0 to 3.0 oz. of gold per ton. The bullion produced was in both cases around 900 fine, gold and silver. In two other plants tilting furnaces equipped with graphite crucibles were used on the same grade of precipitate and the slags contained as much as 30 to 50 oz. per ton. In all instances the slags were free, visibly, of bullion prills and were fluid at pouring.

In the present instance the practice was to grind the granulated slag in a clean-up barrel with mercury for twelve hours or longer. At times a low-grade amalgam could be recovered from the mercury, but in most instances the gold was not affected. The slimed slag was returned to the cyanide circuit, because laboratory tests indicated a high recovery by dissolution. This is true of most cyanide-refinery slags if they are finely ground. The final disposition of slags depends on the relative dollar recovery obtained by local treatment as against that from shipment to a smelter or refinery. In that case the nearest smelter was overseas and it was more profitable to treat the slag at the mine. The secondary matte was shipped, however, because the material fouled cyanide solution badly and treatment of the product in the cyanide plant would have resulted in the circulation of undesirable metals in the circuit.

General—The refining procedure outlined was evolved as a result of unique conditions and therefore cannot be recommended as a standard treatment. The details are given to indicate what may be expected as to the efficiency of the various treatments used. Normally it would have been more convenient and profitable to have shipped a low-grade bullion to a mint or refinery, although the problem of sampling the high-copper material undoubtedly would have resulted in extra charges for remelting and refining prior to sampling. Pyritic refining or modifications of it are applicable in the many plants that produce a base precipitate which is difficult to refine. In some operations the precipitate is so low in grade that it is shipped without treatment. The use of a pyritic flux on such material would be advantageous even if no bullion were recovered before shipping the matte. Freight cost and sampling considerations alone would make this procedure attractive.

The gold balance for this treatment for a considerable period is shown in Table III. The sampling and weighing on which the figures are based was all done in the course of routine refining operations and reasonable care was taken to obtain representative samples. Most of the discrepancies that will be noted are due to the difficulty of taking truly representative bullion samples in all cases without going to more trouble than the accuracy of the work warranted.

Inasmuch as fire assaying was the only analytical method available for control, any attempt to discuss the chemistry involved in the refining processes would be useless. However, the following observations may be of interest: The base metals known to exist in quantity were zinc, copper, lead, and arsenic. Zinc was present in such quantities as to cause a rise in temperature when the precipitate was exposed to air; the bags would begin to steam if allowed to stand as much as an hour before opening. Use of pyrite in the flux undoubtedly formed sulphides of copper and zinc, but the action on lead and arsenic is more in doubt. The presence of arsenic in the final bullion was indicated by a strong garlic odor while the bars were cooling, and a white deposit, presumably arsenic oxide, would condense on the cooling plate when the molds were turned for dumping the bars. Also, the bullion was brittle and harder than would be expected from the gold content. Either arsenic or lead would cause this condition.

Common Refining Methods — An attempt to generalize a discussion of precipitate refining methods is rather difficult. Every plant presents a separate problem, and available literature on the subject contains many contradictory statements. Methods vary with locality. For instance, on the Rand

Table III—Metal Balance of Precipitate Refining

Month	Dry Ppt., Oz.	Fine Au Recovery, Oz.	Primary (a) Matte, Lb.	Cast Iron, Lb.	Secondary Matte, Lb.	Gold in Secondary Matte, Oz.	Secondary Bullion, Oz.	Slag, Lb. (b)	Gold in Slag, Oz.
1	2,480	392	118	17	107	2.3	382	248	5.5
2	2,100	357	86	9.5	69	1.4	279	138	2.7
3	2,380	337	74	6.5	63	1.1	199	101	3.0
4	1,820	246	85	10.0	76	1.2	368	270	2.2
5	1,793	373	59	7.0	54	1.3	146	223	7.4
6	1,382	325	71	7.0	64	1.1	198	76	1.0
	11,945	2,030	493	57.0	433	8.4	1,572	1,056	21.8

(a) Matte from sulphur refining included.
(b) Slag production represents total sent to cyanide plant and does not correspond to monthly clean-ups.

Summary

1. Average gold content of precipitate, 17.2 percent.
2. Average gold content of primary matte, 3.9 percent.
3. Average fineness of secondary bullion, 174 parts gold per 1,000.
4. Loss in secondary matte, 0.40 percent of total.
5. Loss in slag, 1.06 percent of total.

Total Bullion Shipped for Period

1,672 oz. amalgam sponge containing 1,511 fine oz. gold.
2,865 oz. cyanide gold containing 2,030 fine oz. gold.

4,537 oz. total containing 3,541 fine oz. gold.

preliminary acid-treatment is deemed essential, the Australian operator leans toward roasting as a preliminary step, and American practice generally is to smelt and refine directly whenever possible. It is hard to establish justification for any one method over another, but the three considerations of cost, efficiency of gold recovery, and the time necessary to convert precipitate to marketable bullion should govern the choice of method. Two other factors to consider also are handling losses and the possibility of theft, both of which are affected by the method used. Following is a brief discussion of common refining practices and the advantages and disadvantages of each from an operator's viewpoint.

Direct Smelting—Zinc, which normally is the impurity present in the greatest amount, is easy to eliminate by oxidation, and this is accomplished in simple melting. In ordinary smelting, however, lead and copper are carried into the bullion. If these metals are present in only small amounts and the precious-metal content of the precipitate is 40 per cent and up, a good grade of bullion can be produced directly with simple fluxes. Under such conditions the advantages to be gained from any form of preliminary treatment begin to disappear.

Two types of furnaces are in general use: a tilting-type equipped with a crucible, and a reverberatory-type, also tilting, that is lined with a refractory material which must be renewed periodically. Graphite crucibles and furnace linings with a carbon base induce a reducing atmosphere at melting temperatures, and the addition of oxidizers to a flux when this type of lining is used is of little value. Clay-lined crucibles, now on the market, and sillimanite lining in reverberatory furnaces permit the effective use of oxidizing fluxes.

Direct smelting has the advantage of disposing of a clean-up with a minimum of time and handling. It is almost axiomatic that gold losses increase when the handling of precipitate is long and involved. When smelting directly it is advantageous to avoid complete drying, because the material handles more easily and time is saved if fluxing and smelting operations are conducted on damp precipitate. Matte is almost invariably produced in refining precipitate from the treatment of sulphide ores, whether or not oxidizers are used in fluxing. This applies to furnaces with reducing linings as noted in the foregoing. Matte is commonly regarded as an objectionable product, but it can be easily and efficiently reduced in the event that its production is unavoidable. Black[4] notes that the substitution of sillimanite for "Carbofrax" in lining a melting furnace resulted in the elimination of matte.

Acid Treatment—Acid treatment of precipitate prior to smelting is not a cure-all, as is commonly believed, and should be carefully considered before it is adopted on a working scale. Irwin[5] records the impossibility of removing lead from precipitate in Rand practice without careful control of acid strength. He cites instances where acid treatment resulted in a product with less gold and silver percentage than the original. Weinig had the same difficulty some years before and solved it by leaching with hot caustic soda solution following the acid treatment. This dissolved the lead sulphate which had precipitated during the treatment with acid. According to available data, simple acid treatment has no effect on copper in precipitate. In addition to the difficulties involved with lead and copper, acid treatment prolongs the handling of the material, requires heating and filtering equipment, and is generally messy.

Roasting—Preliminary roasting of precipitate is widely practiced in Australia, but few data from this source are available. It is of interest to note that roasting of cyanide precipitate is employed in a country where roasting of gold ore is a feature of the metallurgy. The object of roasting is to convert the base metals to oxides, which facilitates their removal by acid constituents of the flux. Some difficulties inherent in this procedure have been noted in the preceding text and the cause of some of these was probably due to the use of graphite crucibles in smelting. Weinig[2] has published the best description of the roasting treatment to date. In this instance the precipitate was high in impurities and variable in composition, which made it necessary to analyze each clean-up. The material was fluxed according to this analysis and roasted with the flux before smelting. This was done in a clay crucible, and a relatively pure bullion was consistently produced. The extra time consumed in analysis and roasting would be objectionable to most operators, aside from the fact that precipitate analyses are difficult to make and equipment for the work is rarely available in the average mine assay office.

Conclusion

The foregoing description and discussion are written with medium-sized treatment plants in mind, particularly those in foreign, isolated districts. At such operations as these the staff is limited and simple, time-saving methods are essential. Precipitate refining is not difficult, and the material responds to treatments that vary widely in principle. For this reason the fundamentals of its metallurgy are often overlooked and in fact rarely investigated. The description of treatment with pyrite and sulphur is not complete, but an attempt has been made to obtain as complete a listing of quantitative data as possible.

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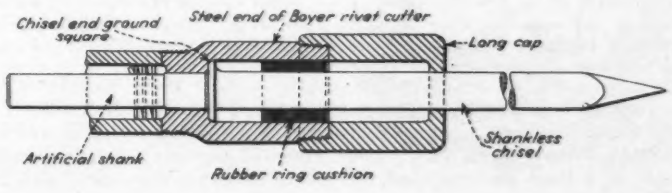
Rivet Cutter Alteration

AN INEXPENSIVE alteration made by Lee Adamson, machine shop foreman at the smelter of Phelps Dodge Corporation, Douglas, Ariz., on a Boyer rivet cutter, making possible re-use of a large quantity of broken steel, has resulted in considerable savings. The cutter, with shanked chisels made from special steel, is used in the reverberatory and other departments for removing slag and furnace incrustations. Prior to the alteration described in detail in the accompanying sketch, chisels were rendered useless whenever a shank breakage occurred. This usually happened at the base of the shank, and because of the relative shortness of the chisel, re-shanking and subsequent use were out of the question. As the number of broken units in storage mounted, an investigation was started with a view to finding a method that would permit re-use of the shankless chisels. The problem was solved successfully by providing the rivet cutter with an artificial steel shank and a longer end cap as shown. A rubber ring cushion supports the hammer end of the chisel in the holder of the cutter, with extra stability or guidance being given by the long cap.



SALTING

The nefarious "art" and its age-old results as practiced on the mining fraternity. (Conclusion)

T. A. Rickard

USE of a strong pocket lens is often helpful in detecting abnormality that may serve as a clue. McDermott recalls that he was examining a vein in Dakota alleged to be rich in silver. The character of vein-matter incited a question as to the form in which the silver occurred. He panned some of the ore, and obtained particles of native silver; these, when examined under a magnifying glass, showed bits of native copper attached. He knew that the intimate association of silver and copper, both in metallic condition, characterized the ore of the Lake Superior copper mines. When he questioned the "honest" miner that was his guide and who had been "kind" enough to assist him in crushing some of his samples, he ascertained that the man had worked formerly in the Lake Superior region. Thus the magnifying glass, together with a logical inference, had detected the fraud.

Inexperienced people, willing to let the owner of a placer property show them how rich it is in gold, will be deceived in various ways. The owner will pan the gravel while smoking his pipe, and the ashes will fall accidentally into the pan. Even the ashes of a cigar have been known to be gold-bearing. It is easy to secrete particles of gold in the operator's finger nails. Many years ago when I was examining a small gold mine in New Zealand, the owners showed, by panning, that the ore contained a satisfactory proportion of gold. They were honest, but, by way of a friendly joke, I offered to do some panning myself, and, while doing so, I salted the ore. I was wearing a corduroy vest, in the upper left pocket of which I had placed specimen gold when in charge, a few months previously, of a gold mine in California. Some bits, about the size of a large pin-head, had remained in the pocket. It was easy to remove them with my finger nails and to drop them into the pan. When disclosed, the owners explained that sometimes they get such coarse gold in association with a greenish chloritic mineral. When they had said enough, I told them how the gold had got into the pan, thereby hinting that I was not a simpleton. A good laugh promoted a better understanding.

In August, 1937, Los Angeles, we are told, was "thrown into feverish excitement" by reports that a radium mine containing ore worth $5,200 per ton had been discovered in Red Rock Canyon, on the edge of the Mojave desert. The owner of the alleged mine was Mrs. Josie Bishop, a sturdy sunburnt widow of 60 or more. For eight years she had been living in her shack within the canyon, and during that time she had occupied herself with desultory prospecting. Her knowledge of mineralogy, it was shown later, was just enough of a smattering to confuse herself as well as others equally ignorant. For many years Mrs. Bishop had been in the habit of sending samples for assay to the State mining department, only to be told that most of them were "duds," containing nothing valuable. It was asserted in a Los Angeles newspaper that "a noted mining engineer and chemist" had made an assay, which proved that the ore contained 130 milligrams of radium per ton. Such ore, it was said, was valued at $40 per milligram of its radium content.

Great was the excitement in southern California. Miners in the neighboring Randsburg district became persuaded that radium occurred in the ore of their claims. From Bakersfield came word that the old San Antonio mine, near Mrs. Bishop's claims, would be examined carefully for signs of radium. Much nonsense was talked and great expectations of flamboyant mine promotion were stimulated. Mrs. Bishop was pestered by "financial agents," anxious to put her property on the market. Ray Bailey, described as an attorney for the enterprising lady, said that no deal would be negotiated, despite the numerous offers already received by the owner, until a careful study of the "situation" had been made. According to this legal gentleman, samples from the claims had assayed as high as $7,000 in radium and $365 in silver per ton. Rich stuff, indeed! He described his client, Mrs. Bishop, as a widow of 60 that had "resided" on the Mojave desert for some 20 years, becoming thereby "a seasoned prospector." In truth, she had only become sunburnt. Mrs. Bishop, it was asserted, had known for several years that her beryl-producing claims contained radium; indeed, samples of concentrate had been tested, with satisfactory results, at the Curie Institute, in Paris, but she had been prevented from announcing the fact by reason of litigation over her property, this litigation having been but recently ended by a favorable Supreme Court decision. To give a touch of romance to the tale, it was asserted that the gallant lady had "stood off" the process servers with a shotgun while awaiting the final settlement of her valuable property rights. Then she had come forth as the guardian of the world's biggest deposit of the precious therapeutic ore.

It may be remarked that the mention of beryl was calculated to bemuse the public, which either did not know what it was or associated it with emerald, which is the precious variety of the commonplace silicate of beryllium. To give a final gassy touch to these tales, it was announced that Mrs. Bishop's ore contained helium. This gas, which is needed to inflate the balloons of Zeppelins and other air-

ships, is associated with the products of petroleum wells, and has no kinship with radioactive minerals.

The tissue of unscientific statements had reached a highly inflammable state. Meanwhile it was announced further that Josie Bishop had located eleven claims covering 170 acres. She had sunk two shafts, one of which yielded, so she said, pitchblende, the oxide of uranium and lead, in which radium is normally present; the other shafts had cut into quartzose ore containing both gold and silver. Her property was a treasure vault of precious things. When asked what she would do with her anticipated wealth, Mrs. Bishop replied: "First thing I'm going to do is to build a home for old miners and prospectors. I know what it means to be down on your luck and hungry, and no place to turn to." This was a human touch likely to enhance her popularity. She went to San Francisco and was wined, dined, and interviewed at the Palace Hotel. It was reported that she had refused $10,000,000 for her mine. In her purse was the sum of 78c. To a San Francisco newspaper Mrs. Bishop said that "something queer happened" to her eyes whenever she was on her beryl claims; her eyes seemed to be "burned." At first she thought it was the face powder she used and then she thought it was the rinse with which she washed her hair. Of course, it was the radioactive rays from the precious mineral! Whereupon she mentioned the matter to a young engineer whom she met in the lobby of a hotel at Bakersfield and at his suggestion some samples were sent to London first and then to Paris. The supposedly clever people that were using her for a successful promotion of her property were doing their best to excite public interest.

Canadian Ore Used to Salt Mrs. Bishop's "Mine"

The bubble was soon punctured. Reid Sampson, from the office of the California Division of Mines, was sent to Red Rock canyon to obtain samples of the ore. These were proved to contain nothing that was valuable—no radium, no gold, no silver—only iron oxide. Other samples told the same story. Mrs. Bishop thereupon threatened to bring suit for $3,000,000 against Walter W. Bradley, the State Mineralogist, and the State of California, for damages. It was an impotent gesture. In some of the fervid accounts of the alleged radium mine it was said that the discovery of pitchblende made in 1930 at Eldorado, on the edge of Great Bear lake, in Canada, had threatened to yield an output that had broken the radium market, previously dominated by the radium deposits of the Belgian Congo. This haphazard mention of the Canadian discoveries was ominous, if only the scribes of the daily press had known it, because there is reason to believe that Mrs. Bishop's claims had been salted with ore brought from the Canadian mine and she herself had been made the victim of an impertinent imposition. Some pitchblende had been placed in the crevices of the rock on her claims; then the perpetrator had "discovered" the occurrence of uranium mineral containing radium, and had sent a sample to Paris, so as to give distinction to his fraud. Later he expected to obtain an option on the Bishop property, and then, aided by the ignorance of the public and of the press, he would have sold the shares at fictitious values. He, the newspaper scribes, and the public overlooked the simple fact that nothing is easier than to determine the presence of radium in a piece of mineral. The finger of the electroscope tells the truth promptly and completely.

Suggestions on Avoiding Trickery

The salting of ore can be done by injecting gold chloride or silver nitrate, as required, into samples that may have been closed tightly and sealed. To guard against this it became customary to put the small sacks containing the samples into a large bag, made of thick canvas, like an American mailbag, which had straps that were closed with a Yale padlock. In sampling a large mine, or a fairly wide lode, it is necessary to take samples weighing from 5 to 20 lb. These can be sacked and sealed, but, owing to their bulk, if numerous, it is customary to have them reduced in size by successive quartering and then to have them assayed somewhere near the mine. For that purpose the engineer will use either the assay office at the mine or another near by. Whether he does the assaying himself or has it done by one of his associates, it is usual for him to store the samples in the assay office and to close it by means of his own Yale lock. Then he tests the fluxes, for fear they may have been doctored. The procedure will vary according to the circumstances.

If the engineer principally concerned is making the examination alone, without any trusted assistant, he is bound, in one way or another, to accept aid from the employees at the mine. He must therefore be wide awake to the chances given them to tamper with his samples. He can safeguard himself by taking one or two check samples that have not been exposed to tampering and he will break one or two solid pieces of ore as a further check, for these, especially if brushed, or washed, are unlikely to have been salted successfully. Another precaution is to fill one or more sacks with barren rock; if the contents should yield a high assay, the suggestion of salting would become obvious.

It is wise, when examining a mine, to establish friendly relations with the superintendent and shift bosses. A genial word, or a cigar, may induce one or other of these men to talk. Frequently they do not want the mine to be sold, because they may lose their jobs with a new manager. Other reasons may exist for their willingness to impart information, and of this the engineer should avail himself. By enquiring into the history of the mine and of its development he may obtain a useful clue, either favorable or unfavorable.

Underground the engineer will not have any familiarity with the workings, and to overcome this handicap he must examine the mine maps carefully, following such study with questions, any one of which may lead to the discovery of essential facts. For example, a block of solid ground, apparently virgin ore, may have been gutted, by a winze or a raise that has been closed and covered by timbering of an unsuspicious character. Thus, in a small mine in which a rich silver vein had been exploited, near Boulder, in Colorado, the owners had removed the larger part of the best ore between two levels by sinking a winze from the upper level and leaving the back of the lower level unbroken. The opening was small and had been closed. Later, when the mine changed hands, the men on the lower level barely escaped death when a raise broke into the hidden stope and caused a large mass of mud and water to come down on top of them.

In a more celebrated case, the Chrysolite mine, at Leadville, a veteran mining engineer, trusting the manager, who was a former fellow student of his at Freiberg, was deceived by assuming from the maps and from information given to him, that a large block of ground was all ore, when, in fact, it was nearly all barren rock. "Eternal vigilance is the price of safety." Vigilance, keen observation, affability, and good luck are the factors that save most mining engineers from being victimized.

Fig. 3 . . . Scraper hoist drags ore to winze skip

Alma Lincoln Is Treating Six-Dollar Ore Profitably

A. A. Smith
Mine Superintendent

W. E. Scott
Consulting Engineer

Idaho Springs, Colorado

THE MINES of the Alma Lincoln Mining Co. are on the southwest side of Clear Creek about 1 mile west of the town of Idaho Springs, Clear Creek County, Colo., and about 40 miles west of Denver. Present holdings are the consolidation of several independent mines that were brought under one ownership and management by C. M. Lyon, president of the Alma Lincoln Mining Co. The South Lincoln, the Josephine, Elliott, and Barber mines, and a part of the Lincoln mine, are owned by the company. The remaining part of the Lincoln mine is held by long-term lease.

These are among the oldest operating mines in Clear Creek County, but it was not until 1933 that they were all consolidated and the present operation was started. Early in the spring of 1933 the Alma Lincoln Mining Co. was formed, and a test run made on ore then exposed in the mines. This experimental test was so satisfactory and results were so encouraging that the mill was remodeled, haulage adits were enlarged, and other necessary repairs made.

Actual operation of the mine and mill was started Nov. 1, 1933, and the property has been in continuous operation since then. The only shutdowns have been to observe national holidays. Regular dividends have been paid by the company for the several years.

There are four separate veins in the Alma Lincoln mine, the Elliott and Barber, the Josephine, South Lincoln, and Lincoln. The most productive of these is the Lincoln, which is the westernmost of the group. This vein strikes N. 40 deg. E. and has an average dip of 45 deg. N. The Lincoln vein is of the pyritic type with small amounts of lead, zinc, and copper minerals present. In most places the walls of the Lincoln consist of granite gneiss with intrusions of pegmatites. Near the apex of the vein a narrow dike of porphyry cuts through the vein at a sharp angle. The South Lincoln is almost parallel to the Lincoln but is considerably steeper. This vein is a strong breccia lead, consisting mostly of fragments of pegmatite and gneiss, imbedded in gouge. Mostly the walls of the South Lincoln are gneiss, but in places one wall is formed by a porphyry dike. Little ore of commercial value has been found in this vein. The Josephine is roughly parallel to the Lincoln and joins the Elliott and Barber to the west. The Josephine has not been worked in recent years, although it produced some ore in the earlier years of the mine. The Elliott and Barber, which is next in importance to the Lincoln, strikes N. 65 deg. E. and dips about 60 deg. N. This vein, a fault fissure, is filled with narrow stringers of quartz and pyrite, some stringers

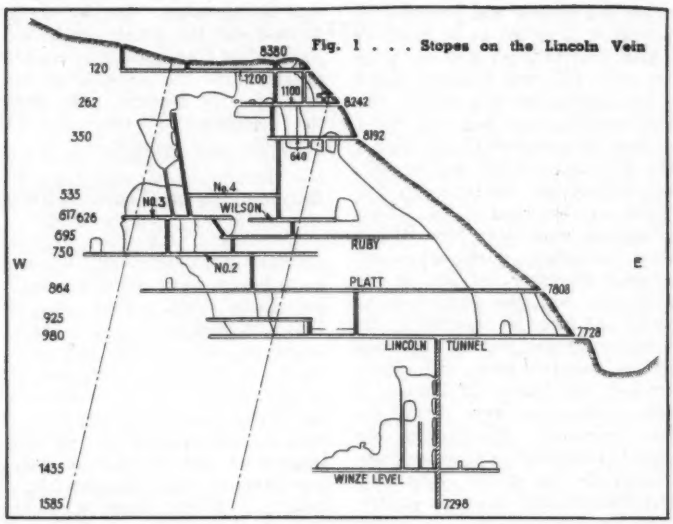


Fig. 1 . . . Stopes on the Lincoln Vein

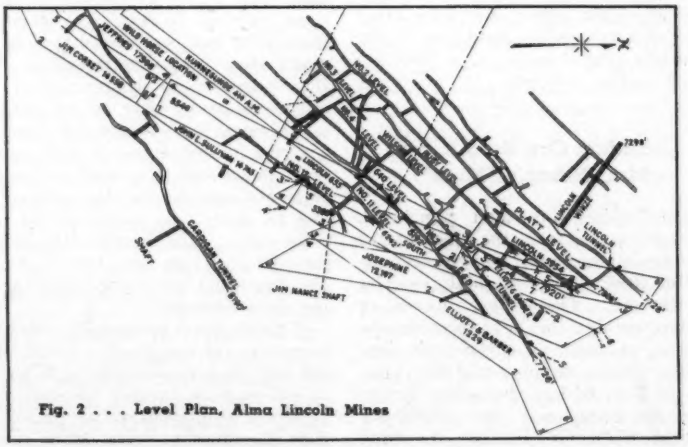


Fig. 2 . . . Level Plan, Alma Lincoln Mines

of galena, and considerable crushed wall rock. The wall rocks are principally gneiss with intrusive masses of pegmatite, and in some places mica schist. On one level, for several hundred feet, the hanging wall is formed by a porphyry dike.

While there is considerable structural folding and some faulting in the veins, there is little actual vein displacement. One principal fault in the Lincoln vein appears to displace the vein from a few inches to not over 6 ft.

The general geology of the district surrounding the mines of the Alma Lincoln Mining Co. is fully described in U.S.G.S. Professional Paper No. 63, "Economic Geology of the Georgetown Quadrangle," by J. E. Spurr and G. H. Garrey.

The width of ore in both the Lincoln and the Elliott and Barber veins varies from 6 in. to 60 in., with an average of about 30 in. In the Lincoln vein the walls are fairly hard and with few exceptions the ore breaks clean from the walls. The walls of the Elliott and Barber are softer and in many places gouge slips cause part of the walls to break with the ore.

Mining is carried on mainly in open stopes with stulls, although formerly it was done by filled stopes with timbered mill holes or chutes. Levels are driven at various intervals, but stopes have been mined successfully with 300 ft. between levels. In the Lincoln vein, with an average dip of 45 deg., metal-lined ore passes and slusher hoists with scrapers are used to move ore.

The Alma Lincoln mine is developed by a series of adits. The principal ones now in use are the Elliott and Barber No. 1 and the Lincoln No. 1. These are at the level of the mill ore bins and about 1,000 ft. below the apex of the veins. Ore from underground chutes is transported to the mill by a 2-ton storage battery locomotive hauling ten 20-cu.ft. cars.

Below the main Lincoln adit level the Lincoln vein is developed by a winze 600 ft. deep. One level 450 ft. below the adit level, and approximately 1,450 ft. below the apex, has been developed. Ore from this level is hoisted in a 2-ton skip and dumped in pockets on the Lincoln adit level and from there taken to mill by motor train.

In driving the winze level a slusher hoist with scraper was used for mucking. This method proved so satisfactory for distances up to 300 ft. that slushing has been used to bring out the stope ore. Ore from stopes drops down the open stopes or down metal-lined ore passes to the drift. There it is picked up by the scraper and dragged to winze skip. No loading chutes are used, as ore is pulled directly into the skip through a hopper. This method of mucking and transporting stope ore has also been used in some of the upper Lincoln workings.

In the stopes, stulls with 3-in. headboards are placed from 5 to 10 ft. apart. Metal-lined ore passes are put in at a distance varying from 50 to 100 ft. apart. At the top of these ore passes, long wings of stulls and lagging extend towards the back of the stope. Over the ore passes are 4-in. grizzlies, which allow a large portion of waste rock to be sorted out. This waste is used for back filling along sides of ore passes. Waste sorting is important, as in places where ore is very narrow a high dilution is caused by breaking stopes to a mining width. In addition to sorting over ore passes, waste is removed wherever possible underground, and then sorted again at mill bins before crushing. About 40 percent of the tonnage broken is removed as waste before milling.

The average grade of ore mined at the Alma Lincoln is about $6 per ton, and it is only by careful sorting and mining economy that it is possible to make such ore profitable.

As the Alma Lincoln Co. mines all its ore from open stopes and uses no waste-filled or shrinkage stopes, it is different from most of the mines of the district. Many mines in the Idaho Springs area have weak walls that must be held by waste filling. In the Lincoln vein it has been found that by stulling open stopes a block of ground 300 ft. long and 300 ft. high can be worked cheaply and safely. After ore is extracted waste from development work is dumped into open stope for support.

While the average grade of ore mined is about $6 per ton, much of the ore mined runs as low as $3 per ton. By mixing ore from different parts of the mine, a tonnage of commercial grade is maintained. Ore value is principally gold, but small amounts of silver, lead, and copper add to the total.

Low costs and good milling make it possible to handle this marginal ore at a profit. During the year ended July 1, 1940, 38,166 tons of ore was milled, 3,180 per month, or 110 tons daily.

The mine works six days a week, one shift, and the mill seven days, two shifts. Average mine crew, surface and underground, is 35 men. The mill crew numbers five, including truck drivers hauling concentrates.

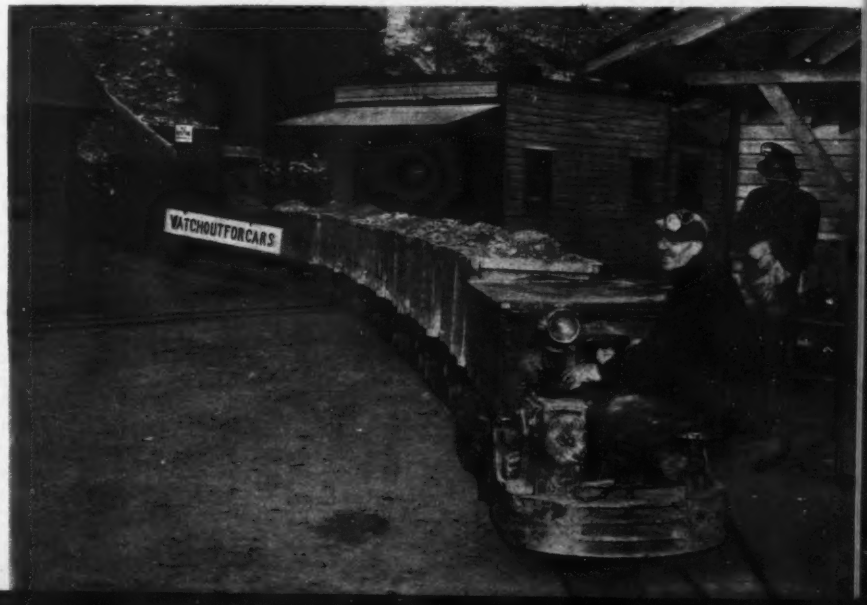
All ore is treated in the company's own mill situated near the portal of the Elliott and Barber tunnel. The mill has a capacity of 6½ tons per hour and is a combination flotation and concentration plant, with grinding done by rod mills. Average mill extraction based on smelter settlements is 95 percent and the concentration ratio 13 to 1. Tailings are dewatered by Allen cones. Solids are trucked away and slimes are settled in ponds near the mill. Concentrates are trucked to the smelter at Leadville by company trucks.

For the year ended July 1, 1940, the average grade of ore was $5.90 per ton, with costs as follows: mining, $2.11; milling, $0.97; miscellaneous, $0.22; total cost, $3.30 per ton milled.

Freight and treatment amounted to nearly 40c. per ton milled, yet the gross profit was $2.22 per ton. Net profits were $1.15 per ton, and $44,000 was paid in dividends.

Recently the Alma Lincoln Mining Co. has taken under lease the Cardigan mine, which is just east of the Elliott and Barber. A crosscut is to be driven from the main E. & B. adit to cut the Cardigan and Donna Juanita veins of this new group. The Cardigan mine has long been idle, but several years ago it was a substantial producer. Also, just recently, the Alma Lincoln company has purchased an interest in the Metropolitan group, comprising some 29 patented claims. This group adjoins the Lincoln group and the westward extension of the Lincoln vein is in Metropolitan ground. Acquisition of these two groups assures life to the Alma Lincoln company for many years.

Fig. 4 . . . Storage battery locomotive hauls ten 20-cu.ft. cars



Vignettes of Geology

Accident of erosion may expose orebodies at profitable or unprofitable horizons—Danger signals to be observed

John Carter Anderson

AN OREBODY, as originally formed, may be likened to a walnut; the "accident of erosion," to what happens when we crack the walnut in our fingers. Infrequently it cracks easily and the whole meat comes out—occasionally we do find a mine where erosion has laid it open to view, but has left all its value for us to take. Sometimes the nut shatters, shell and meat scattering in every direction. That ore deposit has been destroyed by erosion and we may know of its existence only by the placers we find below where it was.

Sometimes a half is left in the shell, or a quarter, or an eighth, and we use a nut pick to get out what remains. That deposit may never become a big mine, but may be worth exploitation, if the program be kept in proper proportion to what is left.

Sometimes a little chunk is left sticking in one corner of the shell, but so small or so tightly bound that we do not bother to pick it out. That deposit should be left alone, no matter how good the assays are, for it will yield no worth-while tonnage of ore.

We have seen that there was a primary zoning in the deposition of the ores, whereby the bulk of the ores of one metal tend to deposit farther above, or from, the source or center than those of another.

It is evident that a primary ore deposit was not everywhere uniform in type, but might change from one type to another, sometimes passing through many zones, some commercial, some barren. This holds true in spite of the fact that in a few places in the world there are mines that have been worked to great depths, as much as two miles or more, without, as yet, a material change in type. All zones were not present in all deposits, but normally all zones present are in a regular, recognizable order.

Veins were formed at all depths, from the greatest to near surface. Since formation each vein has undergone to a greater or less extent "the accident of erosion." One may have been so deeply buried that erosion has not yet reached even to the top limit of its commercial phase. Undoubtedly many deposits of great value exist which have not yet been exposed. Others may be represented at surface only by vague traces that require either a vivid imagination, or great knowledge of the changes in primary deposition, or both, to suggest the possibility for development below. For example, consider the Tintic Standard mine, in Utah, which had to sink a shaft 1,200 ft. in barren ground, under most discouraging conditions, before finding a truly great mine; or the United Eastern mine, at Oatman, with 500 ft. of barren ground above a wonderful orebody.

Others may have been exposed at a commercial horizon, high or low, and so may be mines from the moment that the discoverer first stumbles over them. Most such, however, have long since been stumbled on. This explains the decline and fall of the prospector. Time was, when he might find such a mine with self-evident value, and have something to sell, which he could sell for real money. Whereas, today, all that the prospector usually finds and has to sell is the right to spend money on an outcrop that may become commercial if enough work be done on it.

Elsewhere, "the accident of erosion" may have stripped a deposit, or group of deposits, at or near the bottom of a commercial zone. Good ore may be exposed at surface, and limited development may have indicated considerable lateral extent to the ore. Some of these, to the man who says, "I don't care about the why of it; show me the ore," may, by yielding good assays for good widths, invite large expenditures and equal loss. And all the while the answer as to the possibilities in depth may be written in the outcrop, or in surrounding outcrops, if one knows the changes that took place in the deposition of the ore and can recognize which of these changes is exposed by erosion. These are the mines that always remind me of a man I knew as a boy. He was richer than most of the men he dealt with, but none too reliable. Once a man jumped him for breaking a promise, and he replied: "What, did I break a promise to you? I will fix that. I'll make you another." Such are the mines that by showing up a little ore from time to time tease the owner to continue spending money, when all the time they haven't a chance to keep their promise.

Often several similar outcrops are found in a district at different elevations, and it is thought that because mine "A" outcrops 500 ft. below mine "B," each showing the same type of ore, the ore in mine "B" can be expected to continue to a depth at least equal to the difference in surface elevation. This, however, is not a safe assumption. Often erosion has cut each outcrop to about the same horizon, and this may be at or near the bottom of a given zone; as the point at which a quartz vein bottoms in or near the top of the intrusive with which it is associated in origin. The dike was harder and more resistant than the vein. There had to be a line of weakness for the vein to form, and this continued as a line of weakness, attracting erosion, until the hard dike were exposed. Similar dikes in a district did not all penetrate the crust to the same elevation, or later movements may have distorted the crust so that the top of one dike may now be much above the top of another. In an area where intrusions of a given type were abundant, each of them blossoming with a quartz vein above, present topographic forms may be much influenced by the varying elevations to which the dikes penetrated. The tendency is for erosion to cut fast in the vein, then to be slowed down by the greater hardness of the dike, in which the vein bottoms; so that the high point of the dike remains as a ridge or a summit, with more or less of the vein remaining. Thus, in many districts, we find similar outcrops recurring at different elevations, each showing some ore, yet each without material expectation of extension in depth.

Unless the relationships between the intrusives and the veins be correctly understood and the zone at which erosion has exposed each vein be recognized, there is no sound basis of judgment as to the possibilities for development of the individual outcrop.

In areas that are but slightly eroded we may expect to find veins carrying metals of the higher zones. If these are in association with igneous intrusives they are likely to be of fine texture, as a felsite or rhyolite. If erosion has cut more deeply, we may

find that the veins carry metals of the middle zones, as lead and zinc, often in association with a porphyritic intrusive, as the "birdseye porphyry" of the miner, or a quartz porphyry, or granite porphyry. If the area has been deeply eroded the ore deposits are more likely to be those of the deeper zones, as of copper, in association with intrusive rocks of coarsely porphyritic or granitic texture.

When erosion has cut into the top of the invading "granite," but not too deeply, we may find many gash veins, carrying good values, often showing good copper with relatively high gold, but without any considerable extension in depth.

The more complete our knowledge of the laws governing zonal deposition of the ore, the sounder will be our estimate of what part of the deposit "the accident of erosion" has left.

Danger Signals

When one has learned something of the way in which veins were formed, the zonal changes which took place during ore deposition, and the way in which "the accident of erosion" exposed each vein at a different horizon, he comes to recognize certain conditions, which, when seen in the examination of a mine, or encountered in the course of development, stand out as "Danger Signals." These herald an approach to a change in value or type of ore, or the early end of the deposit. They cannot be ignored safely.

The wise recognition of these "Danger Signals" involves the widest possible knowledge of the geologic history of the surrounding area. The answer as to the possibilities of the property under examination is seldom found by study of that property alone.

A safe rule in most areas is to look first for the "granite." The farther from or above this that the ore is found, the better the chance for persistence in depth. By "granite," in this connection, we mean that granitic mass, be it a true granite, a granodiorite, a monzonite, or whatever other granitic intrusive, was there the original source of the vein-forming solutions.

As a rule the mass contact of the "granite" is barren, showing that a crust started to form on the invading magma before there had been time for any major segregation of the mineralizers.

Most ore deposits were formed in and around high points, or upthrusts from the main granitic mass. Broad expanses of "granite" seldom contain valuable ore deposits, except where there has been a deep-seated reopening of the "granite," after its crust had formed to a great depth. In which case the resulting long-continued segregation of the mineralizers may have permitted the formation of major concentrations of ore. Large roof pendants —that is those parts of the old crust which were surrounded by the invading "granite" and separated from the mass, but which still can be measured in hundreds or thousands of feet in depth—may contain large veins.

Small roof pendants, when found like islands floating on a surrounding sea of "granite," may show many small veins, but are unlikely to contain orebodies of much importance. However, this wide distribution of outcrops, each showing value, unless read rightly, often leads to much wasted expenditure.

Many important mining districts are grouped in or around the high points of granitic intrusion; few in the deeply eroded mass of "granite."

That a "granite" is exposed by erosion near to the top limit of its invasion of the old crust is indicated by the prevalence of small dikes and gash veins. From the moment the crust starts to form, on top of a cooling magma, it is liable to fracture, and the thinner the crust the more likely to fracture. Such fractures must be filled immediately either by a dike, or by a vein if the fracture happens to reach a forming segregation of the mineralizers. Once filled, these fractures are healed and the crust continues to form below the healed fracture. In other words, no vein of this type can go deeper than the thickness of the crust at the moment of formation. This is why in a granite area, near its top limit, we find innumerable small gash veins, often containing very good ore, but each of which can be dug up by the roots in a few feet of work. Such veins may have extended into the old crust, above the "granite," and if enough of the old crust be left, may be of importance. But when in the development of such a vein it is followed into the "granite," it may be expected to bottom soon. A "Danger Signal," in such a vein, is for the walls, that have been free, to become frozen. This indicates that a depth has been reached at which the crust, at the time of vein formation, though solidified, was still so hot that the filling was, as it were, welded to the wall. A frozen wall for a vein in an intrusive rock is always a "Danger Signal."

Often, though the "granite" is not exposed, its nearby presence may be indicated by epidote, garnet, or other contact silicates, or by magnetite. If any of these be present in abundance, with only limited showing of copper minerals, it is a "Danger Signal."

If the deposit is of the type that lies well above the "granite," as a gold quartz vein, and the associated intrusive is not exposed, it is well to study the area for some exposure which shows a connecting link between the "mineralizing" dike and the vein.

As with those ore deposits which are related to the granite areas, just so, the farther a quartz vein is exposed above its related intrusive, the better its chance for persistence in depth.

Many veins go from the top of the dike upwards. Others may continue downward along the dike contact. But the near approach to the top of a dike is often a "Danger Signal," either of a definite bottoming of the vein or a change in type of mineralization. Pyrite may continue on down in the dike, but with greatly diminished gold values. Usually such "porphyries" carry but a dollar or two per ton in gold, as compared with much higher values above. Or silver may increase as gold decreases, and galena and zinc blende may replace pyrite. Hence a marked increase in the silver-gold ratio is a "Danger Signal" of impending loss of gold value.

Just as the top of the "granite" may have many gash veins of small importance, so the top of a "porphyry" dike tends to have many tiny quartz seams and veinlets, that start nowhere and go nowhere. Such veinlets may carry enough value to make the whole mass ore. Oftentimes the "pocket hunter" finds rich pickings in them. But in most cases a little greater depth will show less and less of the quartz, until finally there is only dike, with little or no value in the dike.

Just so, many scheelite-bearing quartz veins may be found to bottom abruptly and permanently in a barren dike.

Once this relationship between dike and vein is determined in an area, any vein where no dike is yet exposed should be most carefully studied and any indication of a near approach to the dike is a definite "Danger Signal." Indications of such an approach may be found in an increase in silver-gold ratio, or other changes in metal content, or by the presence of increasing amounts of feldspars, or the finding of pegmatitic crystals of feldspar or mica with the quartz. In many areas the presence of large shining plates of white mica is a certain indication of a nearby dike.

Because of the great differences in the mineral concentration in different magmas, which furnished the ore, and in the structural and chemical differences in the receptive rocks in which the ores were deposited, there are no hard and fast rules that can be applied offhand in the study of the individual deposit. Each district and each deposit must be studied with an open mind, but when "Danger Signals" show up, don't pass them until you know what they mean there, or proceed with caution until the answer comes.

Remembering always that: "It can be read, if you can read it."

(*Conclusion*)

USEFUL OPERATING IDEAS

Stopping Electrolysis

AT SMALL COST, metallic structures or equipment, such as cables, pipes, tanks, conveyors, etc., can be protected from electrolytic corrosion by the use of a copper-oxide rectifier in series with a low voltage a.c. supply. A bulletin, "Westinghouse Engineering Progress 1940," states that during the last two years many such rectifier installations have been made. Outstanding are those protecting pipe lines, telephone cables, foundations, and water tanks.

Metal is eaten away only when it is the anode of a circuit—that is, when current leaves it and passes into water or any moist mass. If the metal object is a cathode, however—that is, kept negative in respect to the contacting wet earth or material—the current enters the metal and takes nothing from it. Corrosion of pipes inside of mines and of top-works pipes and tanks buried near the surface of the ground is often blamed on acid water or adverse soil conditions when electrolysis is the underlying cause.

▼ ▼ ▼

Welding Grid Joints Stops Heating

WELDING THE JOINTS of cast-iron grid resistors used in the secondary control of the 150-hp. 2,300-v. hoist motor at the mill shaft of an Illinois fluorspar mine eliminated loose contact troubles which had been occurring every few months. As often happens with the old-type resistors, expansion and contraction gradually relieved the compression, thus causing heating of the contacts between grid terminals. That hastened corrosion, which in turn produced greater heat and finally caused arcing.

Modern resistors for heavy duty are fashioned from continuous strips of metal. Instead of going to the work of rebuilding the grid resistors, E. E. Rose, chief electrician, hit on the permanent and much cheaper method—welding grid contacts together and thus securing in effect a modern-type resistor. Without taking the grids apart, the joints were cleaned for about one-quarter of the circumference with a three-cornered file and the resulting notch was filled with bronze weld applied by gas torch.

Arrow points to a weld joining grid terminals

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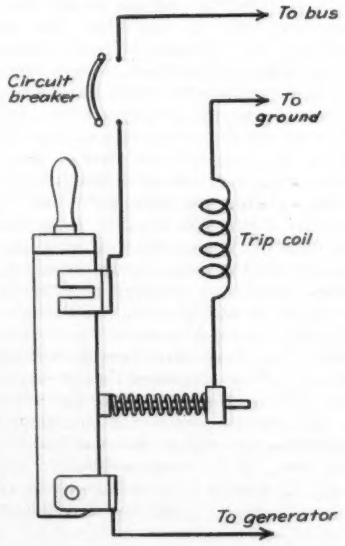
Safety Device for Electric Switch

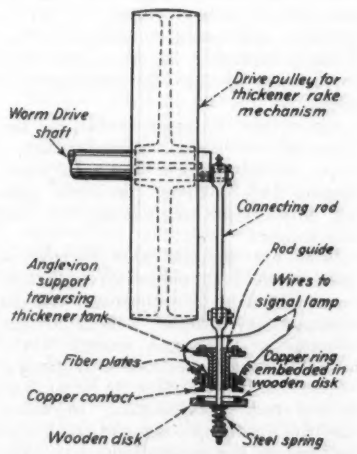


TO PREVENT a person getting burned by opening a switch while a machine is pulling a heavy current, a chief electrician of an operation in central Pennsylvania suggests the hook-up shown in the accompanying diagram. Under this arrangement, the switch must be pushed in tightly to make contact with the trip coil. Then if an attempt is made to pull the switch before releasing the breaker, the breaker will fly out instantly as soon as the switch is moved and thus interrupt the current.

A Thickener Alarm Signal

AT MANY milling plants installation and operation of equipment units somewhat distant from the mill office or central control point in many instances is inevitable, and some alarm or signal system must be evolved if a minimum of plant interruptions is to be insured. Confronted with such a condition (several thickeners situated some distance from the central control room), the staff at the concentrator of Magma Copper Co., Superior, Ariz., developed the simple yet reliable signal arrangement shown in the accompanying sketch. It is attached to the end of the shaft actuating the worm drive mechanism on the thickener, and essentially consists of (1) a short, steel crank pin screwed into the end of the worm drive shaft; (2) a connecting rod; (3) a piston-like rod operating in a circular guide piece resting between the two angle irons traversing the thickener tank, and containing at the lower end a wooden disk with an embedded copper ring, and a compression spring; and (4) two copper contacts insulated from the two angle irons to which they are bolted by fiber or wood plates.

Operation of the device is relatively simple: On every upward stroke of the piston, the copper ring in the wooden disk, by pressing against the two copper contacts, closes the electric circuit and thus causes the signal lamp in the control room to flash on and off. A lit or unlit lamp warns the operator that the drive mechanism on the thickener is out of order.

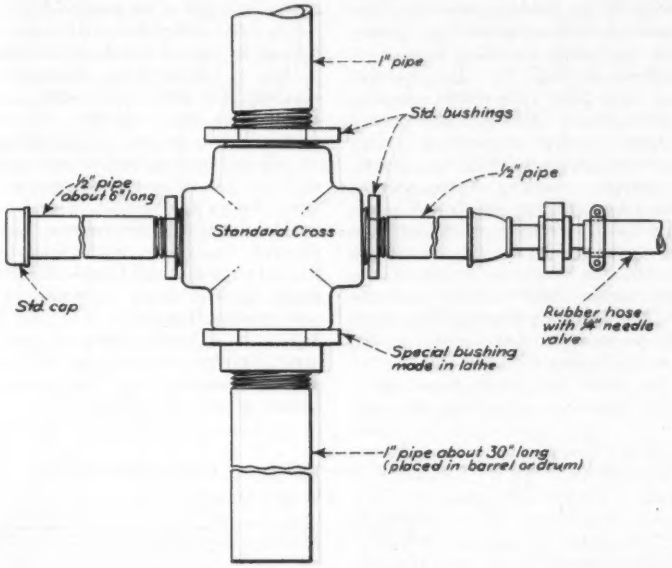


Detail of respective parts of thickener alarm system

Air Lift for Pumping Oil and Other Liquids

A TASK frequently carried out at milling and power plants is the transfer of oil, reagents, and other liquids from steel drums and barrels to tanks or other receptacles installed at appropriate points in buildings housing ore-treatment and power-generating machinery. At large plants this job is usually done by a special pumping plant—an installation that an operator of a small- or medium-size property cannot always afford. At such projects, the air lift explained in detail in the accompanying sketch will prove a valuable tool, especially as compressed-air lines in most cases are available in the mill and power house. It is simple in construction, and can be made in a short time (special bushing, however, requires lathe work) by anyone who may be familiar with pipe tools.

Parts needed include a standard pipe cross; special bushing made in the lathe to hold the piece of 1-in. pipe, about 30 in. long, operating in the drum or barrel to be emptied; one standard bushing for the 1-in. discharge pipe; two standard reduction bushings for the short ½-in. pipes attached to the sides of the pipe cross, and the ½- to ¼-in. reducer and union.


1" pipe
Std. bushings
½" pipe about 6" long
½" pipe
Standard Cross
Std. cap
Rubber hose with ¼" needle valve
Special bushing made in lathe
1" pipe about 30" long (placed in barrel or drum)

When using the device, care should be taken not to open the air valve too suddenly when handling oil, which is generally heavy and hard to move. Pumping can be expedited by letting the drum stand in a warm place before attempting to remove the oil. The valve on the air line should be of the needle type, but an ordinary valve will do if the operator is careful.

New Wood Patterns Preserved by Metallizing

A SUCCESSFUL METHOD of extending the life of wood patterns is by spraying on hot metal, or metallizing. Ordinarily, a pattern has a life expectancy of perhaps 20 trips to the foundry, but when the pattern is covered with a protective coating of metal an increase to 950 trips, or 20 times the average life of an unprotected pattern, has been realized, writes P. C. Ziemke, Milwaukee, Wis.

The method of applying the metal is not complicated, since requirements are only that the wood be first thoroughly cleaned with turpentine and dressed down with sand paper or steel wool to remove any gloss. Then, with the spray gun held at a safe distance to avoid scorching, a layer of 0.005-in. metal is laid on. Only pure zinc is recommended. Without sandings between coats, a second coat of aluminum or bronze is sprayed on. This 0.25-in. final coal is sanded or buffed to final pattern dimension and to any degree of polish desired. Experience with old patterns has indicated that they do not lend themselves to treatment by metallizing sprays.

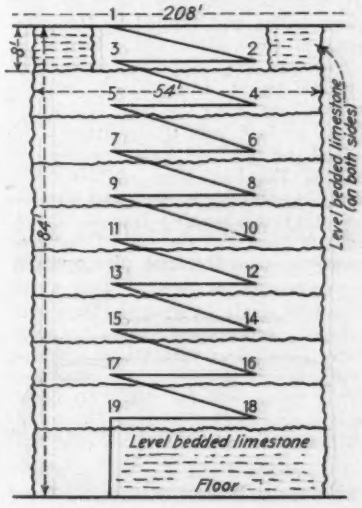
Digs Its Own Way Down

RECENTLY a quarry operator abandoned hand loading in favor of the more efficient power shovel method, writes P. C. Ziemke, of Milwaukee, Wis. Three Mack trucks of 3-yd. capacity each, to be used on the job, were lowered into the 84-ft. pit by means of the rock hoist, but that method was out of the question for the heavy 3-yd. diesel shovel which was to operate on the quarry floor level.

The illustration indicates how the job was accomplished in a short time. Four drillers placed eight holes 4 ft. deep on 4-ft. centers in an area roughly 30 ft. square. When blasted, this rock was cast into the pit by the shovel and the area it previously occupied was next drilled and blasted.

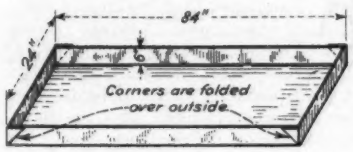
The cycle was repeated until the quarry floor was neared, from which point it "walked" the spoil bank onto the quarry floor. The descent required four days' time. The shovel will never come out of the pit as a unit but will be operated as long as repair costs are justified and will then be disassembled and hoisted out as scrap metal.

An accompanying sketch shows the dimensions and depth of the nine shovel cuts made to reach the quarry floor.



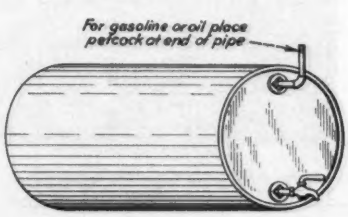
Prevention of Oil Losses

IN THE ENGINE ROOM as well as in the warehouse, when a man comes after a supply of oil, it sometimes happens that the lubricant runs slowly. Having something else in mind while his can is filling up, or misjudging the length of time, oil runs over, often for a considerable loss. To avoid such losses a large pan is placed under the barrel faucet constructed with a sufficient capacity to hold the whole 50 gal., writes Charles Labbe, of Johnnie, Nev.



Such a pan can be made from a sheet of No. 26 galvanized iron 36x96 in. First, the sides are bent over and corners are finished with a mallet over a block of wood without cutting the sheet or soldering. A ½-in. wire can be inserted around the top edge with pliers and hammer, to make the rounded edges and a less flexible pan. The work of transferring the oil back into the barrel if it should be emptied is the chore of the forgetful party, but there is no loss. The accompanying sketch gives the finished dimensions, and the pan will take care of the faucets of three barrels. Its cost is trivial when figured against possible losses and cleanliness of the oil house.

Another common way of losing oil from drums is through the large plug opposite the faucet. As long as oil is being drawn the plug acts as vent and does not leak, but if the plug is not tightened after usage, oil losses occur. To eliminate such losses, have an extra plug drilled and tapped in the drum for ¼-in. pipe, fitted with a nipple, an elbow, and long nipple as shown. The original plug is replaced by the tapped one, with the long nipple upright, so that even if the drum is inclined the oil level never reaches the end of the ¼-in. pipe. Air has free access to the drum. In using gasoline or other inflammable liquids, a petcock is placed at the end of the long nipple to close the small pipe opening.



Making Mine Ladders

A MATTER OF INTEREST at the timber-framing shop of Phelps Dodge Corporation, United Verde Branch, Jerome, Ariz., is the ingenious method of manufacturing mine ladders on a mass-production basis developed by M. Amersek. Here, coordination of the different working phases and use of appropriate auxiliary tools have resulted in a remarkable increase in output.

Figs. 1 to 4 give a graphical step-by-step description of the work involved. The first operation is the notching of the ladder posts. For this purpose there is available the simple layout resembling a shallow filter press explained in Fig. 1. The wooden frame, with three lock screws, capable of holding up to 60 ladder posts, rests on three standard carpenters' horses aligned and held in place by removable spacers. Cutting of the notches in the posts held in the frame is accomplished by a small power saw and two wooden guide pieces, one 8½ in. wide and the other the width of the ladder rung. Both extend over the entire width of the frame. The wider guide piece is pinned lightly to the top of the ladder posts as shown, and the saw subsequently run across. After the cut has been completed, the narrow guide is placed alongside the pinned guide, and a new cut made. This practice is repeated until the entire length of the posts has been cut.

Fig. 2 shows the preliminary planer-like tool used for notching the sawed ladder posts. After a short advance has been made, it is advanced over the entire width of the frame by means of a steel pusher attached to the end of the planer. The smoothing of the cut notches is done with the planer shown in Fig. 3.

The final construction operation—that is, the job of nailing on the rungs—has been simplified and made less tedious by use of the device explained in Fig. 4. Essentially, it consists of wooden base with steel rollers, and a swing seat held between two steel posts. When in use, the ladder posts are placed upon the rollers and aligned with the aid of a wooden spacer, followed by nailing on the rungs.

While nailing operations are in progress the weight of the operator in the seat automatically holds the ladder posts tight in place. Raising of the seat unlocks the posts. Nails are kept handy in a steel container near the seat. Total production per 8-hr. shift, with one man on the job, varies between 30 and 35 ladders.

Progressive operations in making mine ladders and detail of tools required

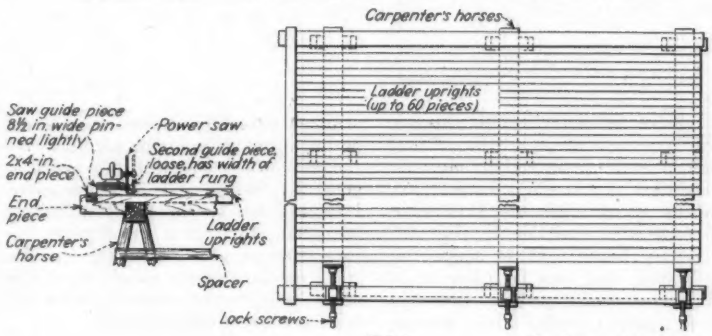


FIG. 1

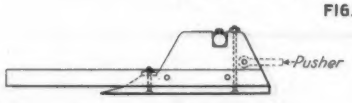


FIG. 2

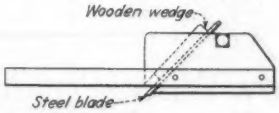
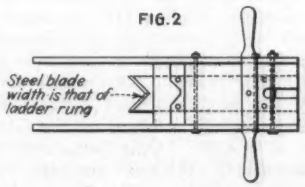
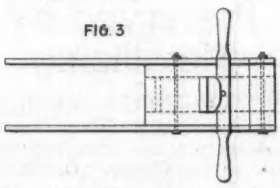


FIG. 3





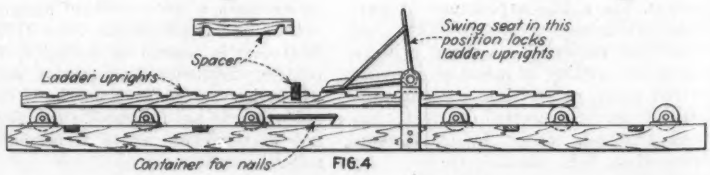


FIG. 4

A Foundation Blasting Job

BLASTING out only a portion of an air compressor's foundation to permit the conversion from an outmoded unit to that of a more modern installation, without interrupting the regular operation of the generating and hoisting machinery at the mine, presented an interesting problem, writes P. C. Ziemke, 2032 West Keefe Ave., Milwaukee, Wis. As the unit occupied the end portion of the power house, only one side of the area it occupied required screening off from the rest of room. This was accomplished by curtaining off the space with sections of old canvas, painter's drop cloths, and similar material, nailed to the gabled ceiling with light strips to exclude effectively the dust produced by blasting.

While the drillers were engaged in putting down the holes, carpenters removed the stops from the windows with idea of removing them at blasting time. After the blast the windows were merely "tacked" in place with a few nails to exclude the cold.

The first two holes in the upper right corner were loaded with ½ stick of 40 percent gelatine as a test shot and fired electrically. The results proved that we had erred on the safe side, and we loaded the next two holes with ¾ stick and found this to be about right.

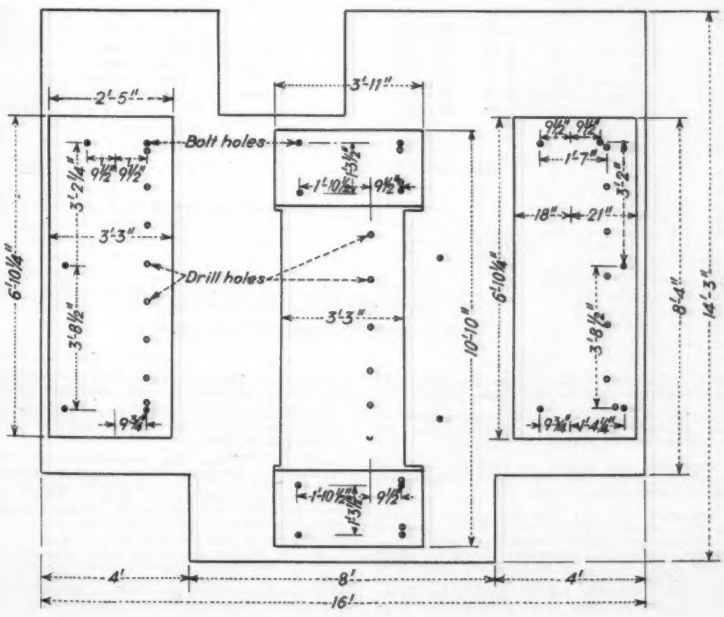
Railroad ties laid edge to edge and interlaced with steel cable were used as an improvised matt, the inequalities or voids being covered with old planking.

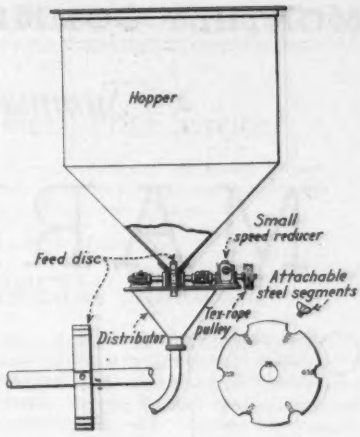
After the first row had been successfully shot, the next line of holes were loaded and fired, three at a time, and later the third row permitted four holes per shot, as we became more expert in placing the matting.

At this time we improved on the situation by loading the first hole with an instantaneous cap, the second with No. 1 delay, the third with a No. 2, etc. The change worked well, as it reduced the displacement of air and prevented the pronounced bulging of the canvas wall. However, the shots, following in sequence without a time interval in which to rearrange the matting as it was shot loose, caused us to take particular pains in securing it prior to the blast.

We soon learned that by placing burlap bagging on the matting and dampening it well with a small hose the usual dust clouds were almost eliminated. Clay substituted for wet newspapers as tamping also showed marked improvement in the accomplishment. In those rare instances where a leg wire was broken by the tamping stick, the clay was easily removed with a brass screw auger.

The diagram indicates the portion of the foundation cut down to the concrete footing from which point the new section was poured in accordance with the new compressor's requirements. Only a portion of the drill holes are indicated, for reasons of clarity. New concrete was keyed to the old footing by drilling a series of holes into which anchor rods were fixed by leading.





Feeder for Dry Reagents

A PRACTICAL DEVICE developed recently by Charles Anderson, repair foreman at the United Verde Branch concentrator of Phelps Dodge Corporation, Clarkdale, Ariz., is the mechanical feeder explained in the accompanying line cuts. It is of simple design, positive in action, and absence of intricate moving parts assures dependable operation and a minimum of maintenance. The feed rate is highly flexible, ranging from practically zero to a maximum of 450 grams per minute. This is made possible by use of a circular disk with threaded semicircular notches spaced around the periphery operating at the bottom of the superimposed storage container.

The quantity of reagent to be discharged from the storage hopper into the distributor can be varied by simply closing one or more notches in the disk by attaching the small steel segments shown. Both hopper and distributor are made from thin steel, plated and welded, and scrap material was used in the manufacture of the feed mechanism proper consisting of the steel disk mentioned, a short shaft and two bearings. Power is furnished by a small electric motor connected to the speed reducer unit coupled to the disk shaft by means of a Tex-rope drive.

Five Dollars Easily Earned

HOW MANY TIMES have you ironed out a kink in electrical maintenance practices? How many times have you short-cut an old shop method to save hours of work? How many times have you studied an operating problem and licked it, to the satisfaction of yourself and your boss? *E.&M.J.* pays a five dollar minimum for all operating ideas accepted for publication.

Summary of the

MARKETS

OUTSTANDING in non-ferrous metals during May was the announcement made in the last day of the month that placed copper under mandatory control. The plan under which the copper industry will operate provides for an emergency reserve, in which 20 percent of April's output will be stored each month, and, after defense needs have been provided for, the remainder will be allocated for civilian use. In view of the heavy demands for copper, inspired some think by fears of a possible shortage later in the year, most producers accepted the control measure as being necessary under existing circumstances. The zinc "pool" for June was increased to 22 percent of production, with opinion mixed as to whether full priorities can be averted. Prices for major metals showed little change during the last month. Call for copper, lead, and zinc continued well in excess of the tonnages that producers cared to sell.

The quantity of foreign copper that will be released during June by the Metals Reserve Company will be lumped with the 20 percent set aside out of domestic production for emergency requirements. Domestic fabricating industry absorbed 123,580 tons of copper during April, against 134,333 tons in March. The decline in deliveries for April was due to strikes at two plants. Domestic producers sold 80,833 tons of copper during May, which compares with 88,203 tons in the preceding month. Large mine operators continued to quote 12c., Valley, with custom smelters and some small producers at 12½c. On new business in standard contracts, the Commodity Exchange set a ceiling of 11½c. a pound, the equivalent of about 12½c. for electrolytic.

Lead was active. Producers restricted offerings. The quotation held at 5.85c., New York. With the shipping situation uncertain, even foreign pig lead was offered with reserve.

Zinc production is increasing, but so are estimates of probable needs. Prime Western zinc held at 7¼c., St. Louis, for the eighth consecutive month.

Tin was in demand and slightly higher in price than in the preceding month.

Inventory control was ordered by OPM on sixteen metals and alloys.

UNITED STATES MARKET

1941 May	Electrolytic Copper: Domestic (a) Refinery	Electrolytic Copper: Export (b) Refinery	Straits Tin: New York	Lead: New York	Lead: St. Louis	Zinc: St. Louis
1	11.775	10.950	52.000	5.85	5.70	7.25
2	11.825	10.950	52.125	5.85	5.70	7.25
3	11.775	10.950	51.750	5.85	5.70	7.25
5	11.825	10.950	51.875	5.85	5.70	7.25
6	11.900	10.950	52.000	5.85	5.70	7.25
7	11.775	10.950	52.375	5.85	5.70	7.25
8	11.825	10.950	52.125	5.85	5.70	7.25
9	11.800	10.950	52.250	5.85	5.70	7.25
10	11.825	10.950	52.250	5.85	5.70	7.25
12	11.775	10.950	52.125	5.85	5.70	7.25
13	11.800	10.950	52.125	5.85	5.70	7.25
14	11.800	10.950	52.125	5.85	5.70	7.25
15	11.825	10.950	52.250	5.85	5.70	7.25
16	11.825	10.950	52.250	5.85	5.70	7.25
17	11.775	10.950	52.250	5.85	5.70	7.25
19	11.775	10.950	52.250	5.85	5.70	7.25
20	11.900	10.950	52.250	5.85	5.70	7.25
21	11.800	10.950	52.375	5.85	5.70	7.25
22	11.850	10.950	52.250	5.85	5.70	7.25
23	11.875	10.950	52.250	5.85	5.70	7.25
24	11.775	10.950	52.125	5.85	5.70	7.25
26	11.800	10.950	52.200	5.85	5.70	7.25
27	11.825	10.950	52.125	5.85	5.70	7.25
28	11.775	10.950	52.250	5.85	5.70	7.25
29	11.925	10.950	52.125	5.85	5.70	7.25
30	Holiday	10.950	Holiday	Holiday	Holiday	Holiday
31	11.775	10.950	52.250	5.85	5.70	7.25
			AVERAGES FOR MONTH			
May	**11.815**	10.950	52.166	5.850	5.700	7.250
			AVERAGES FOR WEEK			
May 7	11.813	10.950	52.021	5.850	5.700	7.250
14	11.804	10.950	52.167	5.850	5.700	7.250
21	11.817	10.950	52.271	5.850	5.700	7.250
28	11.817	10.950	52.200	5.850	5.700	7.250
			CALENDAR WEEK AVERAGES			
May 3	11.788	10.958	51.896	5.850	5.700	7.250
10	11.825	10.950	52.146	5.850	5.700	7.250
17	11.800	10.950	52.188	5.850	5.700	7.250
24	11.829	10.950	52.250	5.850	5.700	7.250
31	11.820	10.950	52.190	5.850	5.700	7.250

SILVER, GOLD AND STERLING EXCHANGE

1941 May	Sterling Exchange: "Checks" (Nominal)	Sterling Exchange: "90-day demand"	Silver (c): New York	Silver (c): London	Gold: London	Gold (d): United States
1	400.000	(f)	34.750	23.5000	168s	$35.00
2	401.000	(f)	34.750	23.5000	168s	35.00
3	401.000	(f)	(e)	(e)	(e)	35.00
5	401.000	(f)	34.750	23.5000	168s	35.00
6	401.000	(f)	34.750	23.5000	168s	35.00
7	401.000	(f)	34.750	23.5000	168s	35.00
8	401.000	(f)	34.750	23.5000	168s	35.00
9	401.500	(f)	34.750	23.5000	168s	35.00
10	401.000	(f)	(e)	(e)	(e)	35.00
12	401.000	(f)	34.750	23.5000	168s	35.00
13	401.000	(f)	34.750	23.4375	168s	35.00
14	401.000	(f)	34.750	23.5000	168s	35.00
15	401.000	(f)	34.750	23.4375	168s	35.00
16	401.000	(f)	34.750	23.5000	168s	35.00
17	401.000	(f)	(e)	(e)	(e)	35.00
19	401.000	(f)	34.750	23.4375	168s	35.00
20	401.000	(f)	34.750	23.5000	168s	35.00
21	401.000	(f)	34.750	23.4375	168s	35.00
22	401.000	(f)	34.750	23.4375	168s	35.00
23	401.000	(f)	34.750	23.3750	168s	35.00
24	401.000	(f)	(e)	(e)	(e)	35.00
26	401.000	(f)	34.750	23.3750	168s	35.00
27	401.000	(f)	34.750	23.3750	168s	35.00
28	401.000	(f)	34.750	23.3750	168s	35.00
29	401.000	(f)	34.750	23.4375	168s	35.00
30	Holiday	(f)	Holiday	23.4375	168s	Holiday
31	401.000	(f)	(e)	(e)	(e)	35.00
			AVERAGES FOR MONTH			
May	400.981	.....	34.750	23.457	....	**35.00**
			AVERAGES FOR WEEK			
May 7	400.833	.....	34.750	.....	....	.....
14	401.083	.....	34.750	.....	....	.....
21	401.000	.....	34.750	.....	....	.....
28	401.000	.....	34.750	.....	....	.....

Calendar week averages, New York Silver: May 3rd, 34.750; 10th, 34.750; 17th, 34.750; 24th, 34.750; 31st, 34.750.

(e) Not quoted (Saturday). (f) No quotations.

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.225c. per pound, the average differential for freight and delivery charges.

(b) Export prices are net at refineries on the Atlantic seaboard and include sales of domestic copper in the foreign market. Owing to the European War and the disruption of normal trade relations, our export copper quotations, since September, 1939, have been based largely on f.a.s. transactions, ex United States ports. To arrive at the f.o.b. refinery quotations deduct .05 from the f.a.s. basis for lighterage.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade Zinc delivered in the East and Middle West in nearly all instances command a premium of 1c per pound over the current market for Prime Western but not less than 1c over the *Engineering and Mining Journal's* average quotation for Prime Western for the previous month.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

(c) Silver other than newly-mined domestic, by Handy & Harman. Under Treasury order of July 6, 1939, the price on domestic newly-mined silver mined subsequent to July 1, 1939, was fixed at 71.11c per troy ounce. Handy & Harman's quotation on newly-mined domestic silver, 999 fine was 70⅝c throughout May.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold in domestic and imported ore or concentrate is at 99.75 per cent of the price quoted by the Treasury, which at present is equal to $34.9125.

PRICES OF METALS • MISCELLANEOUS QUOTATIONS

LONDON MARKET

May, 1941	Tin—Standard—Spot	Tin—Standard—3 months
1	269.7500	267.0000
2	270.5000	267.0000
5	269.2500	265.7500
6	269.2500	266.2500
7	270.2500	267.2500
8	270.5000	267.2500
9	270.5000	267.2500
12	270.5000	267.2500
13	270.2500	267.7500
14	270.0000	267.7500
15	269.7500	267.7500
16	268.5000	267.0000
19	267.5000	266.5000
20	267.5000	266.5000
21	266.5000	266.2500
22	266.2500	265.7500
23	266.0000	266.2500
26	264.2500	265.2500
27	262.5000	264.5000
28	261.5000	263.8750
29	261.7500	263.8750
30	263.0000	264.7500
Average	267.534	.....

Official tin prices on London Metal Exchange in long tons, pound sterling. Trading in copper, lead, and zinc suspended August 31, 1939.

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CURRENT PRICES — MISCELLANEOUS METALS, ORES, AND NON-METALLIC MINERALS

Quotations cover wholesale lots, prompt shipment, f.o.b. New York, unless otherwise stated

(June 2, 1941)

MISCELLANEOUS METALS

Aluminum, ingot, 99 plus per cent, lb	17c.
Antimony, domestic, spot, lb	14.00c.
Bismuth, ton lots, lb	$1.25
Cadmium, commercial sticks, lb	90c.
Calcium, lb., ton lots 97 @ 98 per cent	Nominal
Chromium, 97 per cent grade, lb	89c.
Cobalt, 97 to 99 per cent, per lb	$1.50
Nickel, electrolytic cathodes, lb	35c.
Magnesium, 99.8 per cent, carloads, lb	27c.
Palladium, troy oz	$24.00
Platinum, (Official quotation) troy oz	$36.00
Quicksilver, flask of 76 lb., 100 flasks or more	$180.00
Radium, mg. radium content	$25.00@$30.00
Selenium, 99.5 per cent, lb	$1.75
Silicon, minimum 97 per cent, spot, lb	16.50c.
Tellurium, lb	$1.75
Thallium, 100 lb. or more, lb	$10.00
Titanium, 96 to 98 per cent, lb	$5.00

METALLIC ORES

Beryllium Ore, f.o.b. mines, ton	$30.00@$35.00
Chrome Ore, 48 @ 50% Cr_2O_3 c.i.f. Atl. ports, long ton	(b)$43.00@$44.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$4.75
Mesabi bessemer	$4.60
Old Range non-bessemer	$4.60
Mesabi, non-bessemer	$4.45
Lead (Galena) 80 per cent, Joplin, Mo., ton	$69.58
Manganese Ore, (foreign) c.i.f. U.S. ports, long ton unit of Mn:	
52 @ 55 per cent	(b) 70c.
50 @ 52 per cent	(b) 70c.
46 @ 48 per cent	(b) 65c.
Molybdenum Ore, 90%, per lb. of MoS_2, f.o.b. mines	45c.
Tungsten Ore, per unit of WO_3:	
Chinese, 65 per cent, duty paid	(b) $24.00
Domestic, 65 per cent and upward	(a) $23.50
Vanadium Ore, per lb. of contained V_2O_5	27½c.
Zinc Ore, Prime, 60 per cent concentrate, Joplin, Mo.; per ton	$48.00

(a) Prices at mines, small lots, usually several dollars less. (b) Nominal.

METALLIC COMPOUNDS

Arsenious Oxide (arsenic) lb	3½c
Cobalt Oxide, 70 @ 71 per cent, lb	$1.84
Copper Sulphate, 100 lb	$4.75
Sodium Nitrate, ex vessel, in 200-lb. bags, per 100 lb	$1.42
Sodium Sulphate, bulk ton	$18.00@$22.00

ALLOYS

Beryllium Copper, master alloy, 2.5 to 3 per cent Be, per lb. of contained Be	$15.00
Ferrochrome, 65 @ 70 per cent chromium, 4 @ 6 per cent carbon, per pound of Cr contained	11c.
Ferromanganese, 78 @ 82 per cent, gross ton	$120.00
Ferromolybdenum 55 @ 65 per cent Mo. lb. of Mo. contained	95c.
Ferrosilicon, 50 percent, gross ton	$74.50
Ferrotungsten, 75 @ 80 per cent, lb. of W contained	$1.90@$2.00
Ferrovanadium, per lb. of V, delivered	$2.70@$2.90

NON-METALLIC MINERALS

Asbestos, f.o.b. mines (U.S. funds), ton:	
Canadian (Quebec)	
Crude No. 1	$700@$750
Crude No. 2	$150@$350
Spinning fibers	$110@$200
Paper stock	$40@$49.50
Shorts	$13@$17.50
Vermont	
Shingle stock	$57
Paper stock	$40
Cement stock	$25
Barytes, long ton:	
Georgia, crude	$8.00
Missouri, 93 per cent $BaSO_4$, less than 1 per cent iron	$6.00@$6.50
Bauxite, long ton:	
Domestic, chemical, 55 @ 58 per cent	$7.00@$8.00
Domestic, abrasive, 80 @ 84 per cent	$14.00
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1, bulk	$6.75@$8.00
Delaware, No. 1	$14.50
Feldspar, bulk, ton:	
Potash feldspar, 200 mesh	$17.00
Glass-spar, white, 20 mesh	$11.75
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois 85–5 per cent, all rail movement, ton	$20.00
Ground, 95 @ 98 percent, bulk, ton	$31.00
Lump, acid, 98 percent, bulk, ton	$27.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton:	
Dead-burned, f.o.b. California	$25.00
Dead-burned, f.o.b. Washington	$22.00
Mica, per lb., North Carolina, No. 1 and 2 quality:	
1½ x 2 in.	45@60c.
2 x 2 in.	60@80c.
3 x 3 in.	$1.25@$1.50
3 x 4 in.	$1.50@$1.75
3 x 5 in.	$1.75@$2.25
White, ground, 70 mesh, ton	$60.00@$80.00
Ocher, Georgia, ton	$19.00@$22.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	(a) 12c.
Silica, in bags, 325 mesh, ton	$20.00@$40.00
Sulphur, Texas, mines, long ton	$16.00
Talc, f.o.b. works, ton:	
New York, double air-floated, 325 mesh	$12.00@$15.00
New Jersey, mineral pulp	$8.50@$10.50
Vermont, extra white, 200 mesh	$9.50@$10.00
Tripoli, Missouri, ton:	
40 mesh, cream colored	$14.50
200 mesh, cream colored	$26.00

(a) Nominal

IRON AND STEEL

Pig Iron, Valley furnaces, gross ton:	
Bessemer	$24.50
Basic	$23.50
No. 2 Foundry	$24.00
Steel, base prices, Pittsburgh:	
Billets, gross ton	$34.00
Structural shapes, 100 lb.	$2.10
Bars, 100 lb.	$2.15

Monthly and Yearly

AVERAGE PRICES

SILVER AND STERLING EXCHANGE

	New York		London Spot		Sterling Exchange	
	1940	1941	1940	1941	1940	1941
January	34.750	34.750	21.892	23.273	395.442	(a) 402.000
February	34.750	34.750	20.935	23.341	395.652	(a) 401.864
March	34.750	34.750	20.763	23.446	375.212	(a) 401.788
April	34.750	34.750	20.713	23.500	351.817	(a) 401.058
May	34.949	34.750	21.878	23.457	326.452	(a) 400.981
June	34.825	.....	22.688	.....	359.560	.....
July	34.750	.....	22.095	.....	379.750	.....
August	34.750	.....	23.261	.....	396.889	.....
September	34.750	.....	23.446	.....	401.646	.....
October	34.750	.....	23.451	.....	401.692	.....
November	34.750	.....	23.238	.....	401.783	.....
December	34.750	.....	23.015	.....	402.000	.....
Year	34.773	.....	22.281	.....	382.325	.....

New York quotations for silver other than newly-mined domestic, cents per ounce troy, 999 fine, London pence per ounce sterling silver 925 fine. Sterling exchange (pound sterling) in cents. (a) Nominal.

COPPER

	F.O.B. Refinery, Electrolytic			
	Domestic		Export	
	1940	1941	1940	1941
January	11.954	11.819	11.999	10.257
February	11.148	11.794	11.471	10.414
March	11.160	11.814	11.407	10.592
April	11.087	11.820	11.258	10.952
May	11.079	11.815	11.191	10.950
June	11.128	.....	11.216	.....
July	10.564	.....	10.189	.....
August	10.708	.....	9.851	.....
September	11.296	.....	9.849	.....
October	11.826	.....	10.436	.....
November	11.800	.....	10.084	.....
December	11.802	.....	10.293	.....
Year	11.296	.....	10.770	.....

New York quotations, cents per pound.

LEAD

	New York		St. Louis	
	1940	1941	1940	1941
January	5.471	5.500	5.321	5.350
February	5.076	5.602	4.926	5.452
March	5.192	5.765	5.042	5.613
April	5.071	5.850	4.921	5.700
May	5.015	5.950	4.865	5.700
June	5.000	.....	4.850	.....
July	5.000	.....	4.850	.....
August	4.854	.....	4.704	.....
September	4.929	.....	4.779	.....
October	5.308	.....	5.158	.....
November	5.726	.....	5.578	.....
December	5.500	.....	5.350	.....
Year	5.179	.....	5.029	.....

New York and St. Louis quotations, cents per pound.

TIN

	Straits New York		Standard, Spot London	
	1940	1941	1940	1941
January	46.707	50.154	240.716	256.648
February	45.851	51.293	242.833	264.975
March	47.079	52.067	251.711	270.131
April	46.815	51.981	252.080	269.775
May	51.570	52.166	264.098	267.534
June	54.618	.....	273.438	.....
July	51.591	.....	265.592	.....
August	51.176	.....	262.455	.....
September	50.348	.....	251.024	.....
October	51.490	.....	257.946	.....
November	50.577	.....	258.214	.....
December	50.101	.....	256.988	.....
Year	49.827	.....	256.425	.....

New York quotations, cents per pound. London, pounds sterling per long ton.

ZINC

	St. Louis		
	1939	1940	1941
January	4.500	5.644	7.250
February	4.500	5.534	7.250
March	4.500	5.750	7.250
April	4.500	5.750	7.250
May	4.500	5.803	7.250
June	4.500	6.235	.....
July	4.516	6.250	.....
August	4.719	6.389	.....
September	6.104	6.920	.....
October	6.500	7.250	.....
November	6.500	7.250	.....
December	5.980	7.250	.....
Year	5.110	6.335	.....

St. Louis quotations, Prime Western, cents per pound

CADMIUM AND ALUMINUM

	Cadmium		Aluminum	
	1940 (a)	1941 (a)	1940	1941
January	79.038	80.000	20.000	17.000
February	80.000	82.273	20.000	17.000
March	80.000	89.038	19.769	17.000
April	80.000	90.000	19.000	17.000
May	80.000	90.000	19.000	17.000
June	80.000	.....	19.000	.....
July	80.000	.....	19.000	.....
August	80.000	.....	18.000	.....
September	80.000	.....	18.000	.....
October	80.000	.....	18.000	.....
November	80.000	.....	17.522	.....
December	80.000	.....	17.000	.....
Year	79.920	.....	18.691	.....

Aluminum in cents per pound, 99 plus per cent grade. Cadmium, cents per pound. (a) Producers' price, commercial sticks.

ANTIMONY, QUICKSILVER, AND PLATINUM

	Antimony (a) New York		Quicksilver (b) New York		Platinum (c) New York	
	1940	1941	1940	1941	1940	1941
January	14.000	14.000	156.962	165.846	40.000	36.000
February	14.000	14.000	178.000	170.182	40.000	36.000
March	14.000	14.000	180.921	177.692	40.000	36.000
April	14.000	14.000	173.538	180.077	38.923	36.000
May	14.000	14.000	181.538	180.000	38.000	36.000
June	14.000	.....	197.360	.....	38.000	.....
July	14.000	.....	194.423	.....	38.000	.....
August	14.000	.....	184.111	.....	38.000	.....
September	14.000	.....	173.333	.....	36.167	.....
October	14.000	.....	168.846	.....	36.000	.....
November	14.000	.....	168.391	.....	36.000	.....
December	14.000	.....	164.960	.....	36.000	.....
Year	14.000	.....	176.865	.....	37.924	.....

(a) Antimony, cents per pound, ordinary brands, in cases; in bulk f.o.b Laredo, Tex., 13.000 for February. (b) Quicksilver, dollars per flask of 76 lb. (c) Platinum, per ounce troy.

PIG IRON

	Bessemer		Basic		No. 2 Foundry	
	1940	1941	1940	1941	1940	1941
January	23.50	24.50	22.50	23.50	23.00	24.00
February	23.50	24.50	22.50	23.50	23.00	24.00
March	23.50	24.50	22.50	23.50	23.00	24.00
April	23.50	24.50	22.50	23.50	23.00	24.00
May	23.50	24.50	22.50	23.50	23.00	24.00
June	23.50	.....	22.50	.....	23.00	.....
July	23.50	.....	22.50	.....	23.00	.....
August	23.50	.....	22.50	.....	23.00	.....
September	23.50	.....	22.50	.....	23.00	.....
October	23.50	.....	22.50	.....	23.00	.....
November	23.50	.....	22.50	.....	23.00	.....
December	23.50	.....	22.50	.....	23.00	.....
Year	23.500	.....	22.500	.....	23.000	.....

Iron, dollars per long ton. F.o.b. Mahoning and Chenango Valley furnaces.

PERSONAL ITEMS

Glenn J. Truax has gone to Bogota, Colombia, as metallurgist for the American Gold Mining and Exploration Co.

J. A. Pike, recently with the Tombell mine, at Geraldton, Ontario, is now with the Mountain mine, at Wells, B. C.

A. L. Ransome has been appointed assistant mineral economist of the United States Bureau of Mines.

Keith C. Stansmore, who has been with the Dorr-Oliver Co., Ltd., in London, has been transferred to Toronto.

G. D. Jermain has joined the staff of the U. S. Bureau of Mines in Tucson as mining engineer.

Irvin C. Spotte recently assumed the post of mine superintendent of the Samar Mining Co. in Tacloban, Leyte, P. I.

Charles J. Short has been appointed chief engineer of Hochschild & Co., Pulacayo, Bolivia.

C. A. Heberlein has left New York for Chile, where he will become consulting engineer for Cia. Minera Punitagui.

T. S. McKay has returned from British Guiana and has joined the staff of the Kensington, in Washington, of which Dale L. Pitt is president.

E. B. Webster, formerly an Inspector of Mines in the Province of Saskatchewan, is now retired and living in Vancouver.

A. B. Williams has been appointed manager of Moctezuma Copper Co., a Phelps Dodge subsidiary, succeeding **H. H. Horton,** who resigned last year.

Lee Bundy, formerly mill superintendent for Oro Fino Consolidated Mines Co., Auburn, Calif., has gone to La Luz Mines, Ltd., Sunai, Nicaragua, C. A.

Parke O. Yengst has returned to the United States from Venezuela, where he was with the New Goldfields of Venezuela, and is now at Boulder, Colo.

Martin C. Messner, metallurgical engineer with the Anaconda Copper Mining Co. has been transferred from New York to Anaconda, Mont.

G. A. Swanquist, formerly manager of the Cia. Minera del Divisadero, is now associated with Minas Montecristo Inc., San Miguel, El Salvador, C. A.

C. H. Burgess has been appointed to the position of economic consultant on minerals to the Administration of Export Control, at Washington, D. C.

Clarence Ditson, until recently associated with Waite Amulet Mines, has gone with the Cerro de Pasco Copper Corp., in Peru, as a mine shift boss.

Murray D. Kennedy, formerly manager of Stradacona Rouyn, is now manager of the Upper Seine gold mine, near Atikokan, Ontario.

J. H. Cazier, formerly with the Mountain City Copper Co. in Nevada, has accepted the position of engineer-geologist with the Lexington Mining Co. at Neihart, Mont.

E. Rowland Tragitt, mining engineer in the division of investigations, Department of the Interior, has been transferred from Salt Lake City to San Francisco.

Elwood Stockman, mill engineer for Chile Exploration Co., Chuquicamata, Chile, has returned to the United States and can be reached at 1428 Sherman Ave., Salt Lake City, Utah.

J. R. Boone has resigned his position as mining engineer with the Braden Copper Co., Rancagua, Chile, and has returned to Golden, Colo.

G. G. Campbell is now general superintendent of the Preston East Dome Mines in South Porcupine, Ont. He was formerly mine manager of the Uchi Gold Mines, Uchi Lake, Ont.

Jesse L. Maury has resigned from the employ of The Lehman Corporation, of New York City, to accept a position with the Office of Price Administration and Civilian Supply, Washington, D. C.

Dr. C. F. Rassweiler, until recently a director of the Philadelphia laboratory of E. I. duPont de Nemours Co., has been appointed director of research for the Johns-Manville Corp.

Sherwin F. Kelly gave an address on "Possible Application of Geophysics in the Coeur d'Alene Mining District" before the Columbia section of the A.I.M.E. on April 30.

M. F. Stansmore, who recently returned to Australia from Cyprus Mines Corporation Ltd., Cyprus, is now metallurgist to Gold Coast Main Reefs, Ltd., Prestea, Gold Coast Colony.

Dale L. Pitt, formerly with Big Bell Mines Ltd., in Western Australia, has been appointed president and general manager of Kensington Mines, Seattle, Wash.

Robert F. Playter, geologist for the Lake View and Star, Ltd., in Fimiston, W. Australia, recently returned to the United States after eleven years in Australia. He is now with the Gold Fields American Development Co., Ltd.

Victor Bougard, formerly superintendent of Cardinal Gold, is now chief engineer for the Reward Division of the Golden Queen Mining Co., Owenyo, Calif. **C. E. Bersinger** is superintendent of the latter operation.

Irvin L. Sackett has joined the technical staff of the Freeport Sulphur Co. at its Grande Ecaille mine, in Louisiana. Prior to this engagement he had worked in placer mining fields in Alaska, Canada, Idaho, Washington, and Oregon.

Hugh Leach, mining engineer of Coleraine, Minn., has joined the mine-operating department of Evergreen Mines and is at the Argonne mine, at Nashwauk, Minn., a new producer of the Mesabi range.

Ross Field has returned to the United States from Argentina, where he was mine superintendent for Sociedad Minera Pirquitas. He can be reached at Kelseyville, Calif.

James H. Taylor left the Philippines late in April for a four months' vacation in the United States. For the past four years he has been connected with the Baguio Gold Mining Co. His address is 40 Magnolia Ave., Long Beach, Calif.

J. H. Buehler, manager during the past fifteen years for the Bristol Silver Mines Co., near Pioche, Nev., has been appointed general manager for the Snyder Mines, Inc., operating in Utah and Idaho and with offices in Salt Lake City.

G. B. O'Malley, technical representative in Australia and the Far East for North American Cyanamid, Ltd., and associated companies, has left Australia to visit Malaya, Netherlands East Indies, and the Philippine Islands.

R. A. Angst has been placed in charge of operations of the Montreal Mining Co. to succeed **O. P. Schaus,** who has been transferred to the Cleveland, Ohio, office of Oglebay, Norton & Co. **R. A. Bowen** and **L. E. Dick** will serve as assistants to Mr. Angst. **D. E. Frit** has been named chief engineer.

Harry J. Wolf, consulting mining engineer, New York, recently was appointed consultant on cadmium, Metals and Minerals Section, Production Division of the OPM. His official address in this connection is room 4624, New Social Security Building, Washington, D. C.

Bruce A. Gould, manager of the Klau, Oat Hill, and other quicksilver properties operated by Gould & Co. in California and Nevada, has returned to his headquarters in the Mills Building, San Francisco, from a professional trip to Peru, S. A.

George C. Bateman, Metals Controller for Canada, and **Herbert Symington,** Power Controller, have been appointed to represent the Dominion on a new four-man committee to correlate the war-material resources of Canada and the United States.

Robert H. Raring, for some time resident engineer and manager for the Copper Canyon Mining Co. in Lander County, Nev., has been called to McChord Field, Wash., to assume military duty as first lieutenant of engineers in the aviation division.

H. I. Altshuler, consulting engineer, Casilla 115, LaPaz, Bolivia, has formed a partnership with **A. L. de Romana,** capitalist of Arequipa, Peru, for the expansion of their mining and lumber operations. Tungsten is being produced and other metals are now being developed in Bolivia and Peru.

John Robert Suman, resident of the A.I.M.E., and Mrs. Suman, and **Arthur B. Parsons,** secretary of the Institute, with Mrs. Parsons, were guests of honor at a reception and dinner-dance of the

Chicago section of the Institute held at the Drake Hotel, in Chicago, on May 10.

Dr. Paul D. Merica, vice president of International Nickel Co., was recently presented with the platinum medal of the London Institute of Metals for "distinguished service to the non-ferrous industry." The presentation was made in Washington, D. C., by the British Ambassador to the United States, Lord Halifax.

A. Russell Merz, metallurgical engineer, will take charge of the new tin smelter to be erected by the Tin Processing Corp. (Billiton subsidiary) under U. S. Government auspices at Texas City, Texas. Until recently he was general smelter superintendent of the Roan Antelope Copper Mines in Northern Rhodesia.

L. E. Wheeler, of New York City, long treasurer of Copper Canyon Mining Co. at Battle Mountain, Nev., has been elected president of the company. **Arthur Notman,** also of New York City, has become vice president. Mr. Wheeler and Mr. Notman were also made directors, with **Robert H. Raring,** general manager of the company's mines in Nevada.

Dr. Wilbur A. Nelson, professor of economic geology and head of the geology department of the University of Virginia, has been appointed as a staff expert to the Ferrous Alloys and Minerals Branch of the Priorities Division of the OPM. Dr. Nelson has served with the Tennessee Geological Survey and has been State Geologist for both Tennessee and Virginia.

Alfred Tellam, who has been operating an assaying company and doing local consulting engineering work at Denver, Colo., has been made manager of the Loma vanadium plant at Loma, Colo. This property formerly was owned by W. G. Morrison, of Grand Junction, Colo. Mr. Tellam built the company's 40-ton plant in the fall of 1940.

G. Chesterfield Evans, for many years metallurgist for the Oriental Consolidated Mining Co., Korea, and for the past year and a half with the San Mauricio Mining Co. and Philippine Smelting Co., has a temporary assignment as mill superintendent at the Mangani mine, Sumatra. All three companies are among those managed by Marsman & Co.

A. M. Gaudin, Richards professor of mineral-dressing at Massachusetts Institute of Technology, received the honorary degree of doctor of science in recognition of world leadership in his chosen field of mineral dressing and of his contributions through research and publication to the art of flotation of minerals, on the occasion of Montana School of Mines, 39th annual commencement in Butte, June 4.

J. D. Harlan has been made vice president and general manager of mines of the United States Smelting, Refining & Mining Co., succeeding Edward A. Hamilton, who died early this year. Mr. Harlan joined the company in 1922. He assumed the duties of his new post around June 1. He will be in charge of the company's mining operations in the intermountain and Pacific Coast states.

R. B. Caples, who has been general superintendent of the reduction department of Anaconda Copper Mining Co. at Great Falls, Mont., has been made manager of the department following the death of A. E. Wiggin; and **W. E. Mitchell,** who has been general superintendent of the reduction department at Anaconda, has been named manager at Great Falls to succeed Mr. Caples. **Charles A. Lemmon** has been promoted to be assistant manager of the department. **Floyd S. Weimer** has been made general superintendent and **E. A. Barnard,** who was superintendent of the phosphate and acid plants at Anaconda, has been made general superintendent of the Anaconda reduction department.

Percy A. Seibert, general representative of Braden Copper Co. in Santiago de Chile, received May 14, 1941, from His Excellency the Bolivian Ambassador to Chile, Dr. Hernando Siles, who on this occasion represented the President of Bolivia, General Enrique Peñaranda, the decoration of the Order of the Condor of the Andes with the rank of Knight Commander. The honor was conferred in recognition of outstanding engineering and juridic services rendered in Bolivia by Mr. Seibert from 1904 to 1926. In 1937, the President of Chile, Dr. Arturo Alessandri, conferred upon Mr. Seibert the rank of Knight Commander of the Order of Merit of Chile.

Frank Ayer, formerly general manager of Roan Antelope and Mufulira copper mines, in Northern Rhodesia, and later consulting engineer for those companies, with headquarters in New York, has joined the staff of the conservation section, production division of the Office of Production Management in Washington, D. C. Other appointees to the same staff are **E. J. Hergenroether,** formerly metallurgist in the development and research division of International Nickel Co., and **James S. Earle,** formerly assistant metallurgist of the Federated Metals Division, American Smelting & Refining Co. The duties of these engineers in OPM relate to the conservation of essential metals and minerals by use of substitutes and by reclaiming scrap metals.

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OBITUARY

Charles Dewitt Rooklidge, a pioneer Utah mining man, died on April 28, 1941, at Salt Lake City. He was 77.

Daniel Mikton Phillips, veteran Arizona and Mexico mining engineer, died at Hermosillo, Mexico, on May 11, at the age of 70.

Joseph Wirthlin, Sr., former Tintic mining man, died at his Salt Lake home on April 27. Mr. Wirthlin was born on October 6, 1867.

Eric P. Ericson, supervisor of production of the Oliver Iron Mining Co. in the Hibbing-Chisholm district of Minnesota, and formerly pit foreman at the Hull-Rust iron mine, died recently at the age of 57.

N. E. Giblin, who was superintendent of the West Coast mines of Electrolytic Zinc Co. of Australasia, Ltd., in Tasmania, for the past 14 years, died at the Rosebery mines on March 31. Prior to his residence in Tasmania, he was well known in the management of mines in Western Australia.

L. S. Wincapaw, mining engineer, formerly superintendent of the Golden Center mine, operated by the Cooley Butler interests in Grass Valley, Calif., died in Red Bluff, Calif., on May 3 at the age of 57.

Guy W. ("Wes") Johnson, district manager of the American Zinc, Lead & Smelting Co., died on May 30, 1041, at Joplin, Mo. He was 51 years old. Mr. Johnson was widely known throughout the Joplin district and among the mining fraternity of the United States and foreign countries.

E. S. Chafey, long-time mining operator and promoter of Nevada, California, and Arizona mining properties, died at Wickenburg, Ariz., on March 22 at the age of 64. "Ed" Chafey was a pioneer of the Goldfield and Tonopah days. At the time of his death he and his associates were operating the Newberry mine, at Morristown, Ariz.

George H. Blakemore died at Sydney on March 22, at the age of 72. After beginning his career in Broken Hill as metallurgist in charge of blast furnaces, he assumed charge of operations at the plant of the Smelting Company of Australia at Dapto, New South Wales. In later years he managed the Einasleigh copper mine, in Queensland, and then became mine manager and general manager of the Great Cobar copper mine in New South Wales, ultimately being engaged in consulting practice in Sydney.

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A LETTER

Influx of Gold

The Editor:

RECENTLY you have been publishing some letters regarding the large amount of gold that has come to the United States. Apparently it is the belief of your Washington Correspondent that this influx of gold has been chiefly due to the high price of $35 per ounce, which we have been paying for it, but it seems to me that this is only a minor factor. Since America is a creditor nation with an excess of exports over imports, how else can international accounts be balanced except by the shipment of gold here? The extensive defaults in foreign bonds held in this country, the scramble the world over for American exchange, and our recent lease-lend act of Congress constitute convincing evidence that gold comes to America to meet obligations and to buy things rather than because it finds a high price here. The price of gold is really higher in the currencies of England, France, Italy, and Japan, but in spite of that the flow is to America. Does anyone doubt that we would still have most of the world's gold even if the price had been kept at $20.67 per ounce, where it was for a century?

CHARLES A. ROSE

Berkeley, Calif.

What Metal Statistics Show

PRODUCERS are seeking to supply the increasing metal requirements of the defense program with metal prices unchanged. The *E.&M.J.* Weighted Index of Non-Ferrous Metal Prices shown on this page indicates the effectiveness of the governments desire to keep prices in hand.

The April statistics revealed shipments of 123,629 tons of refined copper, of which all but 49 tons went to domestic consumers. Of the total quantity delivered, 42,858 tons consisted of metal of foreign origin released by the Metals Reserve Company. Stocks of duty-free copper at the end of April amounted to 97,761 tons, a gain of 7,888 tons compared with a month previous. The figures for March and April, in tons, follow:

	March	April
Production:		
Crude	(a) 85,701	88,271
Refined	95,322	88,659
Deliveries, refined:		
Domestic (b)	134,333	123,580
Export	6	49
Totals	134,339	123,629
Stock at end, refined	89,873	77,761

(a) Corrected. (b) Includes deliveries of duty-paid foreign copper for domestic consumption.

Stocks of blister or crude decreased 388 tons during April, against a decrease of 9,621 tons (corrected) in the preceding month.

About 35,000 tons of refined copper were released by the Metals Reserve Company to domestic consumers during May. A similar tonnage is expected to be released in June.

As of April 30, the Metals Reserve Company has virtually taken title to 500,499 tons of copper. The total includes 198,160 tons for which a contract has not yet been executed, it was stated officially. The figures indicate that the Government has been active in acquiring full annual production of the Latin American countries.

▶CHROMITE—The Bureau of Mines will soon attack the problem of obtaining acceptable metallurgical grades of chromium from large known deposits in Wyoming and Montana, now unusable because of high iron content. Congress is supplying $100,000 requested by the Bureau to purchase necessary equipment and carry on work for a year. Technologists of the Bureau feel that furnace treatment of some sort may provide the answer.

▶LEAD—Refined lead stocks, covering metal refined in this country, declined from 45,996 tons at the end of March to 42,899 tons at the end of April. Production totaled 56,086 tons, whereas deliveries amounted to 59,169 tons. With lead refined outside of the United States but delivered to domestic consumers not included in the statistics, the figures are not so important marketwise as formerly. Total deliveries of refined lead during April—domestic and foreign—probably exceeded 70,000 tons.

Statistics covering lead refined in this country for the months of March and April, in tons, according to the American Bureau of Metal Statistics, follow:

	March	April
Stock at beginning	46,604	45,996
Production:		
From domestic ore	46,748	43,423
Secondary and foreign	14,755	12,663
Totals	61,503	56,086
Domestic shipments	62,090	59,169
Stock at end	45,996	42,899

▶MANGANESE — Domestic production of manganese ore containing 35 percent or more manganese was 1,800 long tons during March, against 2,500 tons in February, the Bureau of Mines reports.

General imports of metallurgical-grade manganese ore during March totaled 139,063 tons, containing 63,799 tons of manganese. Imports by countries of origin during March, in tons, follow:

Country	General Imports—Gross Weight	General Imports—Manganese Content
Brazil	49,130	21,146
British Indies	21,677	10,513
Chile	3,038	1,460
Cuba	18,107	8,629
Gold Coast	343	172
Mexico	81	43
Netherlands Indies	550	286
Philippine Islands	12,769	6,169
Union of South Africa	33,366	15,381
Totals	139,061	63,799

▶ZINC—The domestic statistics for April and May, according to the American Zinc Institute, in tons, follow:

	April	May
Stock at beginning	(b) 7,050	7,286
Production	(b) 63,210	64,657
Production, daily rate	2,110	2,086
Shipments (a)	(b) 762,974	63,638
Unfilled orders	95,256	98,435
Stock at end	(b) 7,286	8,305

(a) There were no exports of domestic slab zinc during the months of March and April. May exports totaled 1,192 tons.

A summary of the figures of the Prime Western division for the first five months of 1941, in tons, follows:

	Production	Shipments	Stock At End
January	(b) 26,620	28,209	(b) 4,694
February	(b) 24,814	26,581	(b) 2,927
March	(b) 29,101	28,907	(b) 3,121
April	28,510	28,502	3,129
May	27,657	27,158	3,628

(b) Corrected.

E & M J Weighted Index of Non-Ferrous Metal Prices

(100 is composite for 1922–3–4)

1929	110.33	1935	74.66
1930	82.87	1936	73.45
1931	60.20	1937	90.86
1932	48.26	1938	73.67
1933	59.79	1939	77.71
1934	69.59	1940	79.22

	1939	1940	1941
January	77.12	80.55	82.48
February	76.89	77.23	82.76
March	77.00	77.94	83.27
April	74.79	77.19	83.48
May	73.61	77.68	83.48
June	73.17	78.85	....
July	71.95	76.72	....
August	73.88	76.71	....
September	83.07	79.40	....
October	84.25	82.49	....
November	83.80	83.14	....
December	82.89	82.42	....

Metal Reserve's Metal Purchases

The Metals Reserve Company, the Government's agency for acquiring metals and minerals for defense, has revealed the extent of its operations as of April 30 as follows:

	Tons, Delivered	Tons, on Order or Afloat	Amount
Antimony:			
Chinese	6,796	.....	$1,903,000
Domestic	250	2,750	780,000
Asbestos	.....	1,560	215,000
Chrome ore:			
South African, etc.	12,457	150,543	4,039,000
Philippine	.....	148,000	3,166,000
Copper, Latin-American, etc.	106,722	(a) 393,777	140,110,000
Graphite, Madagascar	411	4,500	486,000
Manganese ore:			
Far Eastern	172,866	442,390	20,533,000
Latin American	16,149	439,945	15,023,000
Domestic	.....	1,490,000	53,155,000
Mica	.....	489	400,000
Tungsten ore, WO3	.....	1,250	2,875,000
Tin:			
Far Eastern	30,375	(b) 119,625	168,000,000
Bolivian	.....	90,000	100,000,000
Zinc	.....	50,000	8,250,000
Antimony, tungsten ore, and tin, from China (c)	.....	.....	90,000,000
			$608,935,000

(a) Includes 198,160 tons for which contract has not yet been executed. (b) Includes 93,024 tons for which purchase contract has not yet been executed. (c) Respective quantities undetermined.

Empire shaft of Plymouth Consolidated mines, Plymouth, Amador County, Calif., rehabilitated recently by the Argonaut Mining Co., Ltd. The 1,280-ft. Empire shaft has been reconditioned to the 500-ft. level and shaft pockets cut on the 400 and 500 levels

CALIFORNIA

Flotation Plant Completed At Jenny Lind Mine

Underground development on several levels begins to supply gold ore to the new 150-ton mill—Shaft of Sheepranch mine being deepened to below 3,000-ft. level.

▶ A modern mine surface plant consisting of a combination office-warehouse building, hoist and compressor house, change house, a 55-ft. steel headframe over the main shaft, repair shops, and a 150-ton flotation mill have been completed at the Jenny Lind mine, formerly known as the Washington, near Hormitos, Mariposa County, by the Pacific Mining Co., Livingston Wernecke, president. The mill flowsheet includes two-stage crushing, flotation, thickening, and filtering resultant concentrates. Material produced by the large placer-type jig between the ball mill and classifier will be treated in an amalgam barrel, and the bullion shipped direct to the U. S. Mint in San Francisco. The 1,600-ft. shaft has been completely rehabilitated to a depth of 1,500 ft. and development work is in progress on several levels. Construction of the surface plant was carried out under contract by Western-Knapp Engineering Co., of San Francisco. Operations at the Jenny Lind mine are directed by P. R. Bradley, Jr., general superintendent, who is also in charge of the company's Pine Tree and Josephine mines, in Mariposa County, and the Harvard mine, at Jamestown, Tuolumne County.

▶ Deepening of the shaft to below the 3,000 level is in progress at the Sheepranch mine, operated by the St. Joseph Lead Co., at Sheepranch, Calaveras County. The mill is treating some 150 tons of ore a day, and about 140 men are employed under the direction of Frank H. Skeels, general manager.

▶ Plans are maturing for early construction of a 250-ton mill at the property of Brown Bear Mining & Development Co., situated in the Deadwood district near French Gulch, Trinity County. Apart from regular mine production handled at a 75-ton milling plant, there is available at the property a large tonnage of commercial dump material. The company is headed by Dr. S. A. Jelte, and E. A. S. Whittard, superintendent, is in charge of operations. E. E. Erich is consulting engineer.

▶ Installation of a flotation plant at the Trail Creek mine, 14 miles southwest of Callahan, Siskiyou County, is planned by Salmon River Mines Co. Considerable development work has been in progress for some time. E. C. Latchem is president and general manager.

▶ Extensive development work is scheduled to be undertaken at the Highway 40 gold mine, near Auburn, Placer County, by the Golden Acacia Corp., A. P. O. Crabtree, president. The mine is developed to a depth of about 200 ft. and is equipped with a small milling plant. Operations at the Acacia property operated by the company in the same district have been suspended, with all work being centered at the Highway 40.

▶ The Golden Gate mine, near Sonora, Tuolumne County, is being reopened by Calmac Mining Co., following a comprehensive diamond drilling campaign. John A. McDonald is president of the company, with George I. Barnett, engineer, in charge of operations.

▶ Ballarat Mining & Milling Corp. has completed plans for the early erection of a 50-ton mill in the Panamint Valley south of Ballarat to handle ores from its properties on the Slate and Panamint Ranges in San Bernardino and Inyo counties as well as custom ores. The company is controlled by Southern California interests. F. C. Fletcher is purchasing agent, with offices at 114 Los Altos Drive, Pasadena.

▶ According to a report from Sacramento, Rustless Mining Corp. is to start work soon on a concentrator of 200 tons' capacity at its chrome holdings near Chrome, Glenn County. The company also operates chrome deposits in the Nigger Hill area of El Dorado County, the concentrates being shipped to Baltimore, Md., for further treatment. H. F. Byram is vice president and general manager of the company.

▶ Marco Messina and associates, of Salt Lake City, Utah, have leased from Frank and Edward Nelson, of Perris, a section of the productive Ida Leona gold mine, in the Good Hope mining district near Perris, Riverside County. Sinking of a shaft and other development work are planned. A small milling plant is available at the property. Some shipments of ore and concentrates have been made to the Midvale smelter, in Utah, in the past.

Metals Reserve Buys Tin

THE Metals Reserve Company has extended its purchasing agreement with the International Tin Committee for six months, beginning July 1. Under the agreement just concluded, the Government will buy 37,500 long tons of pig tin on the unchanged basis of 50c. a pound, c.i.f. United States ports. Federal Loan Administrator Jesse H. Jones said that the plans call for another extension of the accord for six months if the international control scheme is extended. The production control agreement expires at the end of 1941 unless renewed.

View of the 100-ton flotation mill of Southwestern Mineral Co. that treats fluorspar ores mined at properties in New Mexico and around Duncan, Ariz.

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Among lead zinc producers in Arizona is the above property of the Tennessee-Schuylkill Corporation near Chloride, that treats ore at its 150-ton mill located very close to the main shaft

ARIZONA

High Cost Copper Producers Hope for Subsidy

Operations at some properties reported difficult to maintain and supply copper for defense under present price level of 12c.—Miami Copper Co. reports mining lower-grade mixed ores in 1940

▶ At the request of the Arizona Tariff Commission, the Arizona Department of Mineral Resources is conducting a survey of producing and non-producing copper mines in Arizona to determine output possibilities under various price levels. High-cost producers in Arizona and other sections of the country have argued that the 12c. basis is restricting production. The information is being compiled for Price Administrator Leon Henderson. Questionnaires will be sent to all who have produced copper during the last five years as well as potential producers. High-cost producers hope for some form of subsidy in the event that the authorities decide against disturbing the prevailing 12c. basis that now obtains on the bulk of the country's current production.

▶ F. W. Maclennon, vice president and consulting engineer, Miami Copper Co., Miami, Ariz., in his annual report to the company for 1940 stated that operations were carried on throughout the year in both the mixed and sulphide orebodies. Tons of ore mined and treated and net copper produced were as follows:

	Tons of Ore	Assay, % Cu. Total	Oxide	Pounds Copper
Mixed ore..	887,777	1.121	0.663	17,328,630
Sulphide ore.	4,412,827	0.658	0.079	46,801,053
Totals ...	5,300,604	0.736	0.177	64,129,683

▶ The ore production tabulated above is equivalent to an average daily production of 2,501 tons of mixed ore, 12,430 tons of sulphide ore, or 14,931 tons total ore for the 355 days of plant operation during the year. In addition to the copper production listed above, there was a production of 803 oz. of gold, 1,168 oz. of silver, and 383,124 lb. of molybdenum in the form of concentrates. Mining operations and ore production from the 1,000-ft. haulage level were materially expanded, so that at the end of the year nearly 60 percent of the entire sulphide ore production was coming from this level. No new ore was developed during the year. Reserves as of Jan. 1, 1941, are estimated to be as follows:

	Tons of Ore	Per Cent Copper Total	Soluble
Mixed ore....	1,496,612	1.587	0.902
Sulphide ore..	63,119,451	0.896	0.092
Total	64,616,063	0.912	0.111

▶ The grade of the mixed ore was materially lower than that of the previous year and the grade of the sulphide ore was slightly lower. This was due in both cases to mining the last remnants of orebodies on the 720-ft. level. In the treatment of the mixed ore, the metallurgy was almost identical with that of the previous year; in the treatment of sulphide ore, it was slightly better. In molydenite concentration there was improvement. New construction expenditures amounted to $226,522.49, including expenditures for new construction and repair of the Old Dominion water-supply system.

▶ In June 1940 the company adopted a plan of annual vacation with pay for all employees qualified by length of employment. It was decided that there would be less interference with operations if all of these vacations were taken at one time, when the entire plant could be shut down for major repairs. The plant was therefore shut down for this purpose for five days, July 4 to July 8.

▶ Trucks have hauled around 2,500 tons of manganese ore from the Artillery Peak section of Mohave County to the experimental laboratory of the U. S. bureau of mines at Boulder City, Nev. The manganese properties belong to the Arizona Manganese Corp., the Chapin Exploration Co., and others, held under contract by the M. A. Hanna company of Cleveland, Ohio. The work of the department of mines is under direction of Robert S. Sanford. Some method of concentration by which the product of the property can be brought up to the federal requirements is being undertaken. It is reported that the Hanna company will install a small pilot plant for treatment of the ore.

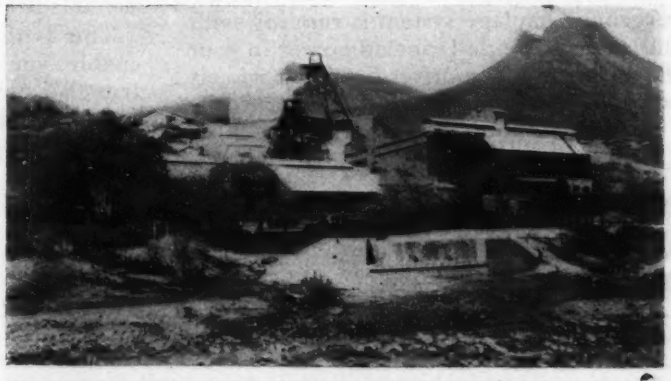
▶ The Holy Moses Mines, Inc., have their shaft down 120 ft. on the company's property 5 miles south of Kingman, in Mohave County. Some good gold ore has been encountered. Frank E. Buchanan and W. K. Lentz are owners of the property.

▶ A tungsten project has been started by the U. S. Bureau of Mines in Carr Canyon of the Huachuca Mountains. A crew of 25 men are employed and the work of the department is under the direction of W. D. McMillan, engineer of the Bureau.

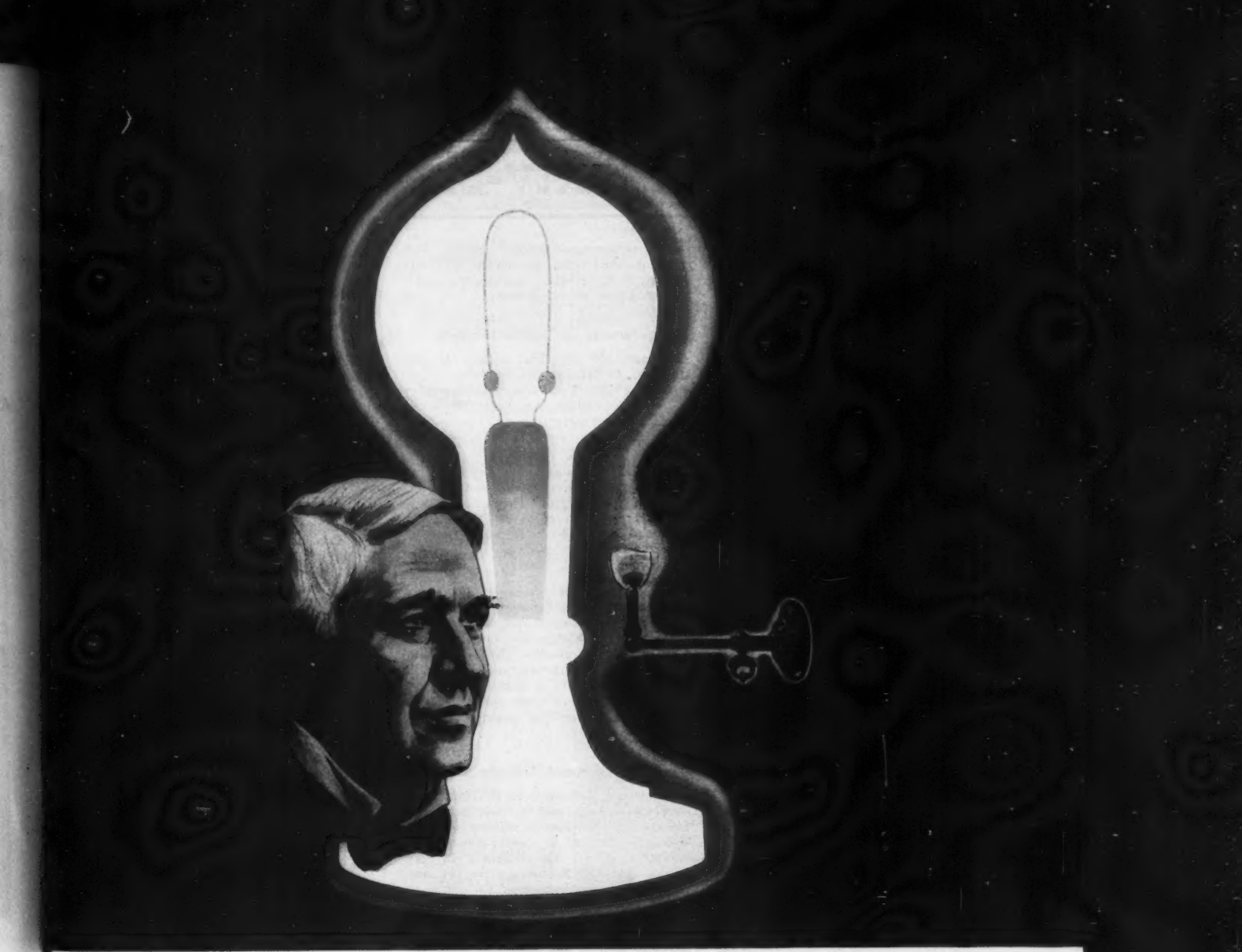
▶ Patagonia Metals Mills, Inc., are erecting a 50-ton mill north of Patagonia. The company is headed by Delmar Lord and High McCullum. The mill will treat ore from the company's mines, upon which over 2,000 ft. of development work has been done. Test shipments have been made to Salt Lake City and it is expected that the new mill will make a concentrate containing above 60 percent manganese. G. T. Humphries is general manager, Box 2401, Tucson.

▶ The cyanide plant of the Producers, Inc., near Chloride, is operating at capacity on custom ores. A considerable tonnage of the custom ores is coming from the Searchlight and El Dorado Canyon areas across the Colorado River in Nevada. H. W. Thorne is manager of the Producer's company at Chloride.

▶ Tran Smith and Robert Goodrich have started development of the Manganese property south of Boulder Dam and are shipping by truck to Boulder City, Nev.



Main shaft and crushing plant at the Ray copper mine of the Nevada Consolidated Copper Corporation, Ray, Ariz.



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It Happened in Sixty-Six

Engineering and Mining Journal was established 75 years ago in April as the American Journal of Mining. Our anniversary will not be celebrated, however, until next August, when we shall publish a Diamond Jubilee issue of E.&M.J. In the meantime, we shall reprint each month a few selected items from Journals of 75 years ago. The following are culled from the issues for June 1866.

Magnesium

Magnesium is made in Boston from dolomite, or magnesium limestone, by the Sonstadt method. The principal use for the metal is to burn for light, the actinic power of which is 1-36th that of the sun, though the intensity of the light is 1-525th that of the sun.

A "Dangerous" Substance

The San Francisco *Morning Call*, of recent date, contains an article which seems to us to convey the idea that sodium amalgam is a dangerous substance, which is untrue. It may have intended to inform its readers that the metal *sodium* itself is dangerous, which is a fact, but not to the extent stated. Let our contemporary, or any of our other readers desirous of testing the matter, take a piece of sodium about the size of a half-dime and drop it into a tumbler of water, and he will see the metal almost immediately ignite, with a strong, clear, whitish light, burning about as long as the sulphur on a "lucifer match," leaving a black ash and a cracked glass. No other effects will be observed.

The Holladay Overland Mail

Having consolidated the property of the "Overland Stage Line" and the "Overland Dispatch Co.," and reduced their

rates of fare nearly 25 percent [this Company] will run a daily line of coaches to all the principal points in the gold mines of Colorado, Utah, Montana, Idaho, Nevada, California and Oregon.

Rates of fare:

Between Topeka, Atchison Nebraska City, Omaha	and Denver	$125
Between same points and Salt Lake City		250
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Between Salt Lake City and Boise		125
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To San Francisco 16 days

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Horace Greeley on "Sodium Amalgam"

On page 152 of this volume of the JOURNAL OF MINING, we had occasion to correct a San Francisco contemporary, relative to "Sodium Amalgam." Another candidate for correction now comes forward. The New York *Tribune* for June 5th, says:

> "Sodium Amalgam is the name of a new explosive compound of California origin. The explosive power of one ounce of this material is said to be equal to that of twenty-five pounds of gunpowder."

These lines quoted contain just three gross errors. Firstly, sodium amalgam is *not* an "explosive compound," secondly it is *not* of "California origin;" and thirdly, the explosive power of one ounce of the metal "sodium"—which is the only material in sodium amalgam that of itself is explosive—is *not* "equal to that of twenty-five pounds of gunpowder."

German Science and American Vim

We referred last week to the fact that America had to look to Germany for her scientific training in mining matters. We may remark in continuation that one-third of all the students in the mining school of Freiburg, Germany, are American, notwithstanding the distance from their own country, and the foreign language in which the education is conveyed. The knowledge and practical skill acquired during the course of so many centuries in Germany, when united with the go-ahead force of our own countrymen, will undoubtedly produce results highly beneficial to the mining interest of the United States.

Glad Tidings

The "Petroleum Company of West Virginia," in its advertisement published in an English paper, states that there are 342 Petroleum Companies in America with a nominal capital of $251,355,000, and that many of them are paying dividends of from 4 *to* 20 *per cent per month upon the capital subscribed*. This would be very delightful news to the shareholders if there were but 4 to 20 per cent of truth in it.

Good News for Coloradians

We have good authority for stating that Mr. Herman, representative of the great copper-smelting firm of Vivian & Sons—who have no less than two hundred and fifty furnaces at Swansea, South Wales, hard at work all the time—recently arrived in this city to make personal inspection of some of our American copper ores. Having seen some of the ores from Colorado and tested the same, he pronounced the results *fabulous*, and on the 14th inst. he left Atchison, Kansas, on his way to that land of buried riches. It seems that he is of the same opinion with Mr. Lyon, and others, that the only true way of reaching the precious contents of Colorado lodes is by smelting.

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John Torry, M.D., LL.D., Botany
Charles A. Joy, Ph.D., General Chemistry
William G. Peck, LL.D., Mining Surveying
John H. Van Amringe, A.M., Mathematics
Ogden N. Rood, A.M., Mechanics and Physics

Chili Copper

One of the principal sources whence copper is derived is Chili. The richest lodes and deposits have, it is said, been exhausted; but the supply of copper still comes, notwithstanding the war in which the Chilian Government is engaged. The copper yielding districts are of very great extent, and appear to be capable of supplying the markets of the world. The peculiar mining laws of Chili tend to keep up the supply, notwithstanding a slackness of demand. If a Chilian miner finds his sett becoming less productive, he has not only the inducement to continue his operations, which a hope of its increasing in richness holds out, but also the certainty that, if he abandon his mine, even for a short time, he loses his claim, and Government may re-let it.

The Mineral Land Bill

Yesterday's city papers contained in their dispatch from Washington, the following omnious dispatch:

Mr. Stewart called up the bill

to regulate the occupation of the mineral lands, and to extend the right of pre-emption, which after a discussion, was passed.

So the U. S. Senate—wherein the mining States and Territories are numerically better represented than in the House—has done nearly all in its power to damage the great mining interests of the nation. The bill thus passed is but a re-vamp of Senator Sherman's obnoxious bill—the modifications amounting to little or nothing. However, it is one consolation to reflect that the House of Representatives, which adopted the Kasson resolutions—and is therefore to that extent bound by them—cannot pass this injurious bill without stultifying itself. Better have no legislation than *such* legislation.

NEVADA

New Orebody on Comstock Lode Reported

Surface and underground development on deposit of Cons. Chollar, Gould, & Savage Mining Co. assures ore for long-term mill supply

▶Development of a surface orebody of major volume in extending its long open cut on the outcrop of the Comstock lode at Gold Hill, Storey County, is reported on property of the Cons. Chollar, Gould & Savage Mining Co. Low-grade gold ore from the surface pit has been supplying the 400-ton flotation mill, mined by power shovel and carryall. The new orebody has been opened by underground workings and is said to ensure a long-term mill supply. Thomas V. Barton, of San Francisco, is managing director and F. V. Dempsey is superintendent at Gold Hill.

▶The 38th annual report of the Tonopah Belmont Development Co. for 1940 showed net loss of $7,849.81, resulting chiefly from the destruction of the main shaft by fire in late 1939. Since then not more than five leases have been operated at any one time. In October the company sold its Nevada Belmont mine and its outmoded mill at Hamilton, White Pine County. Smelter shipments continue from the Belmont Phoenix property in Clark County. John L. Dynan is superintendent and Fred Steen is auditor, in charge at Tonopah.

▶A body of shipping-grade ore has been opened on the 200-ft. level in workings of the Reliance Mining Co. at Manhattan, Nye County, reports indicating a substantial width of 2-oz. gold ore. The company operates a 50-ton cyanide mill. Hugh R. Van Wagenen, of Los Angeles, is manager.

▶Equipment of a 1,500-ton cyanide tailing-treatment plant, operated since 1928 on tailing from the long-dismantled cyanide mill of the Goldfield Cons. Mines Co. by the Bradshaw Syndicate Inc., is being moved to Millers, former milling center on the Tonopah & Goldfield railroad, 14 miles northwest of Tonopah, where Mark Bradshaw, president, and his metallurgist associate, Albert Silver,

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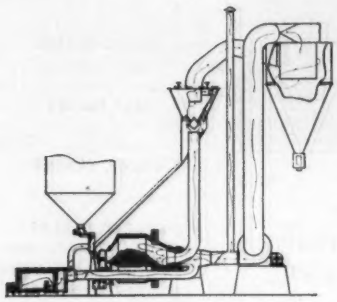

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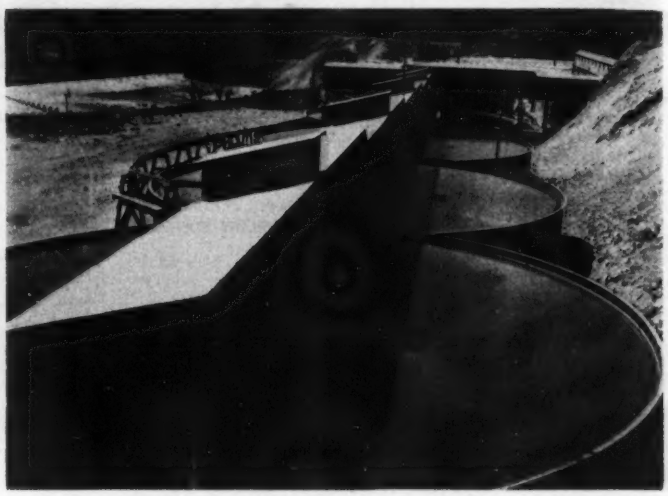

Large cyanide tanks comprise this important division of the milling process of the Consolidated Chollar, Gould & Savage Mining Co., a leading gold and silver producer along the Comstock lode in Nevada

▶NEVADA

have obtained a lease on some 2,000,000 tons of silver-gold tailing from the old 500-ton cyanide mill of the Tonopah Mining Co. of Nevada. Albert Silver, of Tonopah, is in charge.

▶At Copper Canyon, in Lander County, employes of the International Smelting & Refining Co., which has a five-year option on stock control of the Copper Canyon Mining Co., are completing excavation for camp buildings and for a new deep shaft, heavy shaft and mine timbers having been delivered by truck. Ore shipments to the Tooele smelter continue from leases, chiefly in the Copper Basin area. J. J. Lillie, manager for the Mountain City Copper Co., is in charge. S. R. Dronbay, superintendent, was transferred from the California property of the Walker Mining Co., an International subsidiary, to replace Robert H. Raring, resident engineer and manager for the Copper Canyon Co., retained as general superintendent by International but lately called to military duty.

▶It is reported that the lately organized Cons. Goldacres Corp., with property in the Tenabo district, Lander County, has awarded to the Western Knapp Engineering Co., of San Francisco, a contract for immediate construction of a 500-ton mill employing combined sliming and sand leaching. A well drilled five miles from the millsite developed a flow of 500 g.p.m. Harry C. Bishop and A. E. Moynahan, of Denver, are heads of the company and in charge.

▶Under the direction of A. E. Vandercook, mining engineer of Sacramento, Calif., the Hale & Norcross tunnel, main entry to underground workings of the "middle" group of mines on the Comstock lode at Virginia City, is being repaired in preparation for reopening the inside shaft and laterals extending into the Savage mine at the north and the Chollar and Potosi at the south.

▶Directors of the Getchell Mine, Inc., decided to pay no dividend in May, having paid from 3c. to 5c. monthly during the past year. Additions to plant installation and tax imposts were given as reasons for passing the dividend.

▶Consolidated Coppermines Corp., now shipping 9,000 tons per day to Kennecott's Nevada Consolidated Copper Corp. concentrator at McGill, set new records in 1940 for production and earnings. John A. Payne, president, reported net funds available from earnings to be $1,699,014.76, after deduction of $150,000 for Federal income taxes. Of this amount, the company paid $794,087.55 in dividends, or 50c. per share. Cassius I. Cook, general manager at Kimberly, reported 1940 output of 2,769,084 tons yielding 52,976,621 lb. copper, 29,340 oz. gold, 74,453 oz. silver, and 214,410 lb. zinc.

UTAH

Utah Copper Miners Get Wage Increase

Daily rate now at highest in the history of the Company—Smelter at Murray expected to operate throughout summer to meet demand for lead

▶Effective May 1, the wage scale of Utah Copper day-rate employees was raised 25c. a day to the highest levels in the history of the company. Machine operators are now receiving $6.70 per shift; mechanics, $7.20; millmen, $6.30; and common labor, $4.90. The Utah Copper mine is operating at a new high level, producing about 80,000 tons daily.

▶War-demand for metal will keep the Murray smelter of the American Smelting & Refining Co. operating throughout

the summer, the first year since 1930. About 325 men are employed. Enough lead ore and concentrate are stocked to keep the smelter operating for the next four or five months, reports William J. O'Connor, manager of the Utah department. Deliveries of concentrates from Australia and South America will determine whether the smelter operates during the full year. The A. S. & R. plant at Garfield, producing at the rate of 47,000,000 lb. of metallic copper a month, is employing 1,200 persons and turning out 27 percent of the nation's red-metal output.

▶Driving of the Elton Tunnel near Tooele was stopped at the 23,475-ft. mark by the National Tunnel & Mines Co. To drill holes to the Utah Apex 2,500 level for drainage purposes. Advancement of the tunnel toward its objective, the Rood Shaft, will be held in abeyance until the Utah Apex workings have been drained.

▶The United States Smelting, Refining & Mining Co. shipped 2,904 tons of ore during 1940 from the Utah Metal & Tunnel property at Bingham, reports James A. Donough, president of the latter company. Yield from net smelter returns totaled $46,198. The smelting company has a 20-year lease on the property.

▶Western King Mines, Inc., organized by Gray Brothers, of Salt Lake City, has acquired a lease in the Ophir Queen Mines Co. in the Dry Canyon district, near Ophir. Equipment has been installed at the Heist incline tunnel and work started to sink into the Madison limestone horizon.

▶Park City Utah Mines Co. reduced its net loss from operations to $4,641 in 1940, against a net loss of $29,003 in 1939, reports O. N. Friendly in his annual statement to stockholders. Ore sales, less smelter charges, amounted to $195,581 from a total production of 10,083 tons.

▶Park City Consolidated Mines Co. has completed payment on all property claims belonging to the St. Louis Ontario and the East Ontario Mining Co., and to Mrs. Hulda Andrew, according to Gloyd M. Wiles, vice president and general manager. The company is now deepening its No. 2 winze from the 1,300 to the 1,400 level.

▶Three Eureka miners and a medical student—Jim Quigley, George W. Manson, Alma Olsen, and Ralph E. Christopherson—have discovered a deposit of tungsten-bearing scheelite in the West Tintic district, 33 miles southwest of Eureka. Ore for a milling test has been taken out of the Bates shaft, south of the Tintic Western shaft.

▶Leasers working in the Mountain View mine, in the Tintic district, shipped 3,908 tons of ore during 1940 with a net value of $20,216, the company's annual report states. Control is owned by the International Smelting & Refining Co.

▶The New Park Mining Co. will pay its first dividend, amounting to $30,400, or 1c. a share, on June 10, W. H. H. Cranmer, general manager, announced. Sinking of a three-compartment shaft has been started 7,500 ft. from the por-

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Pgs. 4-7—Prices and specifications on complete Sinta-Set line of bits

Pg. 3—Eight basic reasons why Sinta-Set Bits offer better results

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▶UTAH

tal of the Mayflower tunnel to reach the footwall of the Park Galena fissure. The company is also driving a crosscut to the Rosebud fissure.

▶Snyder Mines, Inc., is treating 450 tons of low-grade oxide ore daily in its cyanide plant at Mercur. Ore is coming to the plant from a number of mines in the two-square mile area surrounding the mill. When road conditions improve, production will be increased to 500 tons daily. About 100 tons of high-grade ore is being shipped direct to the smelter. During 1940, Snyder Mines, Inc., with a production of 25,000 oz. of gold, was the second largest yellow-metal producer in the state. Operations are employing 140 men.

▶Leasers in the Bingham Metals mine, at Bingham, are mining high-grade ore on the 1,200 level, reports James A. Marsh, of Copperton.

▶The shaft of the Mercur Dome Gold Mining Co. is nearing the 800-ft. level, with the objective Madison limestone about 100 ft. ahead.

IDAHO

Operations Under Way at Constitution Mine

Rehabilitated property is equipped with modern 100-ton plant—Fisher and Baumhoff plan moving gold dredge from Warren Meadows to Bullocks Ranch, near Elk City

▶Reports from Pine Creek are to the effect that production at the rate of 100 tons per day has started from the old Constitution gold mine, now owned by the Spokane-Idaho Mining Co., of which J. P. Graves, of Spokane, is the president. William P. White is the local manager. The new company has driven a new crosscut tunnel connecting with the shaft from the Pine Creek side and has erected and equipped a modern 100-ton mill.

▶Fisher & Baumhoff, pioneer dredge operators in southern Idaho fields, plan to remove 1,200 tons of dredging machinery by truck from Warren Meadows to the Bullock ranch, about one mile from Elk City. Moving operations are to be started in July, according to report, and a dragline dredge operation started at the Bullock place on a large acreage of placer gravel.

▶Howard Conn and associates of Clarksfork have leased the Terrible Edith property, at Murray, and started installing mining equipment. The leasers propose sinking the shaft and opening the ore on new levels while engaged in cleaning up ore left in the old stopes. Arrangements have been made to treat the ore at the Golconda mill.

▶Gold Producers Corp., operating the old Grunter property, at Shoup, is reported to be making a 95 percent saving on a $4 gold ore in a modern 150-ton flotation plant. Concentrates are said to run 6 oz. in gold and 10 oz. silver and are shipped from the mine in 15-ton trucks to Salt Lake smelters at a cost of $11 per ton for freight and treatment. About 25 men are employed under the management of McLean brothers.

▶Sunshine Consolidated Mining Co., following up their recent silver ore discovery in the Yankee Girl vein in a crosscut from the 3,100 level in the Sunshine mine, is drifting on 5 ft. of commercial vein matter, according to reliable reports from the mine.

▶The Jack Waite mine, in the Murray district, operated by the American Smelting & Refining Co., for the Jack Waite Mining Co., enjoys the rather peculiar distinction of being the only mine in the Coeur d'Alene district that is operated in two states, Montana and Idaho. The property is on the state line and the easterly rake of the orebodies has carried them across the line into Montana on the lower mine levels.

▶Arthur Campbell, state mine inspector, states that Blaine County now has the largest mining operation in Idaho south of the Salmon River. The operation is by the Triumph Mining Co., and combines the Triumph mine, formerly owned by the Ivanhoe Mining Co., and the North Star and Independence mines, formerly owned and operated by the Federal Mining and Smelting Co. All these properties prior to March 16, 1940, were owned by the Snyder Mines, Inc. J. W. Swent is president of the Triumph company and C. B. Greeley, secretary, both of San Francisco. The company owns 59 patented and 49 unpatented claims in the Warm Springs mining district.

▶The Penman Mines Corp., of which W. M. Yeaman of Yakuna, Wash., is president, produced 1,925 oz. of gold and 1,843 oz. of silver in 1940 from concentrates shipped to the Bunker Hill smelter, according to company report. Production this year is expected to more than double the 1940 record.

▶Bunker Hill Mining & Concentrating Co. has declared its second quarterly dividend for this year, amounting to $327,000, or at the rate of 25c. a share on the outstanding stock. In the 1940 report Stanly A. Easton, president, states Bunker Hill ore reserves blocked out and ready for mining as 2,773,846 tons. The No. 21 level, 2,400 ft. below the Kellogg tunnel, is the deepest operating level in the mine, but during the year a pilot shaft was put down an additional 400 ft. to the No. 3 level and during the present year this level will be opened for production.

▶In sinking the main shaft at the Coeur d'Alene Mines from the 2,400 level a surprise vein of lead-zinc ore was encountered at the 2,600 level, or 1,600 ft. below the main tunnel, showing about 8 in. of high-grade ore in 3 ft. of vein matter, according to Robert Baily, engineer for the company.

▶The Lucky Friday company at Mullan has completed its 200 ft. of shaft work started some months ago and now has the shaft down 300 ft. below the tunnel level. Officials of the company

announce that they will probably diamond drill for some distance both north and south of the shaft before starting crosscut.

▶The American Eagle Mining Co. is installing a ball mill and cyanide leaching tanks on a gold property near Elk City. The plant will also treat about 3,000 tons of tailings from the original stamp-mill operations.

▶The Lemhi Flotation Co., headed by Arlin Davidson and R. W. Leonard, has erected a 60-ton capacity gold quartz flotation and concentrating custom mill plant at Salmon City, Idaho, and is now treating custom ores from the surrounding district. The plant is powered by a Buda-Lanova heavy-duty diesel engine.

ALASKA

Treadwell Yukon Corp. Will Operate Galena Hill

Work started on Elsa and Calumet properties—Six dragline gold-mining operations getting under way in the Ruby district near Fairbanks

▶Treadwell Yukon Corp. will operate on Galena Hill again this season. The announcement that the company would have its mill in operation in May caused many employees who were preparing to leave the camp to change their plans and return to work at the Elsa and Calumet properties.

▶At least six draglines will be in operation this season in the Ruby district near Fairbanks. Vance Hitt and Pete Miscovich are putting rigs to work on Poorman and Flat creeks. Long Creek Mining Co., the Greenstone Co., and the Midnight Mining Co. will each have outfits in operation and another dragline is said to be ready for digging on Trail Creek.

▶The heaviest production of platinum in Alaska in 1940 came from the Goodnews district, near the mouth of Kuskokwim River, in the southwestern section of the Territory. The deposits are mined by dredge and dragline in manners similar to those of gold placers. Some palladium is recovered with the platinum. The platinum production in Alaska totaled approximately $1,092,000, in value in 1940.

▶Fred Bleecker reports that he was able to get his placer operation under way on First Chance Creek, in the Fairbanks district, ten days earlier this season than last year. Later he will plan to employ a dragline and bulldozer.

▶Manager J. H. Scott says the Riverside mine, on Salmon River, across the border from British Columbia, will ship $60,000 worth of tungsten ore a month through Prince Rupert to the United States. He expects his first shipments to be made in June. A 100-ton mill is in service at the mine.

▶Much snow compelled the Nukalaska Mining Co., at Nuka Bay, to postpone operations this spring until the middle

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▶ALASKA

of June. W. V. Conley, president and manager, will employ about ten men from Seward during the season. Two hundred feet of tunnel will be driven as the first step toward putting the property into production.

OREGON

Consolidation Under Way In Virtue District

Lode and placer properties being brought under head of Intermountain Mining Company and associates—Miners at Cornicopia Gold Mines receive wage increase

▶A consolidation of lode and placer properties in the Virtue district, east of Baker, is being effected by Charles E. Silbaugh, president of the Intermountain Mining Co., and by J. C. Robinson, both of Baker. The interests being brought together are the Smith and Niblock, adjoining the Virtue mine; the Bowman placers; the George Cullen group; the Pat group; and properties held by William Wendt—a total of about 800 acres. A small force of miners is doing assessment work on the properties.

▶P. A. Rokne, of Baker, is in charge of operations getting under way at the Simmons mine, near Cornucopia. The aerial tram destroyed by fire, and its cable, are being restored.

▶A. V. Quine, the new superintendent of Cornicopia Gold Mines, says labor relations of the company have been improved by a one-year agreement made with an affiliate of the A.F.&L., which composed many existing differences and also brought about a wage increase. The company will develop ore in the Wallingford and Valley View veins, where it expects good results. Additional equipment is to be delivered in June.

WASHINGTON

Manganese Deposit Being Explored

Property containing it is on Olympic Peninsula—Operations at the Holden mine of the Howe Sound Co. now in fourth year

▶The Crescent manganese property near Crescent Lake on the Olympic Peninsula is being explored under the direction of Rowland King, Spokane mining engineer. The property is owned by Charles S. Anderson and associates, who have given a lease on it to a group of mining men, including some of the large stockholders of Sunshine Mining Co., of the Coeur d'Alenes.

▶Howe Sound has started its fourth year of operations at the Holden mine, in the Cascades. It reports net profits for the first quarter this year at $800,480, compared to $558,278 in the same quarter last year. Its annual payroll expense now exceeds $900,000 and its average payroll is 485. The output of copper-gold ore from its 2,000-ton flotation mill was 689,000 tons last year, compared to 597,000 tons in 1939. Concentrates are shipped 12 miles by trucks, then by barges 43 miles down Chelan Lake, and thence by rail to the Tacoma smelter.

▶President Louis Schermerhorn, of Spokane, reports that Grandview Mines Co. is now receiving the maximum royalty of 15 percent from the operation of its property by American Zinc, Lead & Smelting Co. in the northeastern corner of the State. Grandview receipts are between $4,000 and $4,500 a month, which goes into a fund towards dividends.

▶The new 300-ton flotation mill of the Northwest Magnesite Co., Chewelah, to which reference was made in *E.&M.J.*, March, 1941, p. 82, is expected to go into production in June, although delay in delivery of material may postpone the effective date. The process has been under development for two years in a 5-ton pilot plant. Howard Ziebell is supervising engineer of the project, and A. W. Fahrenwald is flotation consultant.

COLORADO

Carleton Tunnel Advances To Cut Veins

Project is now close to 30,000 ft. from portal after passing through broken zone of New Market fault 60 ft. wide.—One company undertakes sinking below Roosevelt Tunnel

▶Work on the Carlton tunnel in the Cripple Creek district, is again under way. The New Market fault was 60 ft. wide, and is timbered. It is thought that the Mohican vein and the Bobtail vein will be cut soon. During the stop in operation the track was raised, and the locomotives were overhauled and the motors raised to obviate danger of damage by water. Water is draining from the Portland mine at the rate of about two feet a day. At the Cresson mine the water level is below the 1,800-ft. station and is draining at the rate of 15 in. per day. On May 11 the tunnel was in 29,400 ft. and the water flow was still at 8,000 g.p.m. Already the water has receded sufficiently from shafts of the deeper properties to permit mining on the deeper levels, and the ore shipments recently in the Cripple Creek district have been of higher value.

▶The first new sinking below the Roosevelt tunnel by any company outside of the Carlton interests in the Cripple Creek district has been started by Gold Producers, Inc., on the El Paso mine, and this sinking of the winze on the El Paso CK&N vein is into the 1,100 ft. of new ground made available by the new Carlton tunnel. The winze is down 60 ft., with some assays running between one-half and three ounces of gold per ton. It is believed that the 1,100 ft. of new ground has been drained for some time, and it is definitely proved that

with the completion of the Carlton tunnel much additional good ore can be developed.

▶The Cobalt Gold Mining Co. smelter, 4 miles north of Boulder, was blown in April 19, the furnace being tapped by Ward Yeager, manager. J. M. Myers is superintendent of the smelter. Considerable ore has been piled up in the smelter and the company's mine at Gold Hill, and limestone was shipped from Longmont. Cobalt Gold Mining Co. did 2,518 ft. of diamond drilling in 1939 at its property near Gold Hill, according to E. N. Goddard and T. S. Lovering, geologists, in a paper before the American Institute of Mining and Metallurgical Engineers, which paper states: "Numerous samples of the primary ore taken by the company yielded from 0.41 to 6 percent nickel, 0 to 0.60 percent cobalt, and small amounts of copper. Samples of supergene ore contained 1.32 to 13.02 percent nickel, 0.22 to 6.22 percent cobalt, and 0.05 and 31.60 percent copper. The deposit of nickel-cobalt ore, seems comparatively small, and the ore-bearing beds are so dislocated by the diorite stock and by pegmatite dikes that it is impossible to project their extensions far beyond the mine workings. The ore is probably genetically related to the Pre-Cambrian diorite stock."

▶The Vanadium Corporation of America, the headquarters of which are in Boulder, has completely remodeled its mill three miles from Naturita on the San Miguel River near Telluride and is treating about 50 tons of vanadium ore daily, which ore is mostly from the company's properties in Montrose and San Miguel counties.

▶John Murphy is making plans to reopen his tungsten property near Gunnison, and this work will be started as soon as the snow, the heaviest in years, has run off, making the property accessible. He contemplates installation of a hoist and compressor and will drive 500 ft. of tunnel and deepen the shaft 200 ft.

▶Treasure Mountain Gold Mining Co., headed by Guy L. V. Emerson, Midland Savings Bldg., Denver, will erect a 25-ton mill at the Sandiago tunnel on Treasure Mountain in San Juan County, 12 miles north of Silverton, this spring and treat ores from the Golden Fleece mine.

▶William Buckley, of Silver Plume, and his associates are reopening the Rio Grande Zeda gold mine, on East Leavenworth Mountain. This property has been closed for about five years.

▶Diamond drilling has disclosed the fact that the Elsie orebody in the Mammoth mine, near Boulder, continues below the lowest level in the Elsie mine. Good ore was encountered in the north drift on the fourth level, and the shaft is being sunk 50 ft. and is reported to be in ore. These mines are owned by W. L. Tanner and Guy Tanner, of Nederland.

▶The Banner Mining Co., in Idaho Springs, is resuming operations of its Clear Creek placer east of Idaho Springs. It has purchased a part of the electric line from the Manion placer, which will be extended from the Argo to the company's placer ground.

Quote
"Dayton Consolidated Mines Co. was the largest producer on the Comstock lode in Nevada during 1940. The cyanide plant of the company, shown above, treats ore on a custom basis trucked from many districts."
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Small Fluorspar Mines Busy

ACTIVITY in the fluorspar industry of southern Illinois and western Kentucky, which in 1940 was marked by extensive improvements at mines, mills, and flotation plants of the larger companies, was parallelel by the opening of numerous glory holes working down from the grass roots. In the photograph are visible five of a dozen or more mines newly opened in a field of winter wheat along U. S. highway 60 between Marion and Salem, Ky.

Shafts, one in each building, are as a rule 4x4 ft. in the clear and they hit the top of the vein at 2 to 10 ft. from the surface. The first levels, extended 50 ft. each way, usually are driven at a 25-ft. depth and the succeeding lower levels at intervals of 15 ft. Typical equipment of each mine consists of a gasoline-driven air compressor, a 25-lb. jackhammer, and a 3-hp. gasoline engine

Each mine has a lease on a 100-ft. length of the vertical vein, which ranges from 2 to 6 ft. in thickness. These mines will work to depths where water influx calls a halt or until hoisting equipment becomes inadequate. The limit may be reached at 75 to 150 ft. Someday the deeper ore will be mined from larger deepwell pump for removing the water.

A crew of four men, two working underground and two on top, produces 5 tons of unwashed ore per day, which in that raw condition brings $12 per ton. As a rule the hoisting is done by two men turning a double-crank windlass equipped with manila rope.

TRI-STATE

Flooded Mines Dewatered By Large Pumps

Some properties already operating—Several old mines being rehabilitated for production this summer

▶ Following the worst mine floods in April during the history of the mining field, dewatering of the flooded areas was rushed in May. Water which flooded the Oronogo mines leveled off rather rapidly, permitting the resumption of operations at the Oronogo Mutual Mining Co.'s open-pit mine within a week after the floods. Eagle-Picher moved a large pump from the north Webb City field, to a shaft north of Center Creek to supplement another large turbine pump already installed there. These two pumps, with a capacity of more than 10,000 g.p.m., were used to dewater the lower workings and to handle the inflow and overflow from the Webb City field into the Oronogo mines. In the flooded Picher area, including the Whitebird, Jay Bird, Acme, and Admiralty mines, additional pumps were installed to dewater the underground workings.

▶ Early in June nearly all major companies in the district were operating their properties on a six-day work-week, paying time and one-half for overtime above the 40-hour-week maximum. Some of the companies had been on a six-day schedule for several months previously.

▶ As an aftermath of what happened six years ago in the Tri-State district when 600 miners voted to strike, the spotlight of news for May this year was focused again on the labor situation in the Tri-State district. On May 9, by a vote of nearly two to one, mine and mill employes of the St. Louis S. & R. Co. expressed their desire in a NLRB election to be represented by the St. Louis Mining and Smelting Workers local No. 514, International Union of Mine, Mill and Smelter Workers, an affiliate of the C.I.O., for the purpose of collective bargaining. Of a total of 385 votes cast, 254 employes favored the union and 131 were against. A total of 455 employes was eligible to vote, leaving 70 who did not cast a ballot. Another factor in the labor situation was a decision handed down May 21 in St. Paul, Minn., by the United States Circuit Court of Appeals, whereby labor board findings 18 months ago against the Eagle-Picher Lead Co. and the Eagle-Picher M. & S. Co. in the Tri-State mine strike controversy were affirmed. Effect of the appellate court decision is to uphold the

labor board in making awards of hundreds of thousands of dollars in back wages to striking C.I.O. miners of the field and to order reinstatement of a large number of them. Following the court's announcement, it was indicated Eagle-Picher would move for a rehearing, and, if that is denied, the case probably will be appealed to the United States Supreme Court.

▶Eagle-Picher M. & S. Co. has started the sinking of two new shafts near Wentworth, according to G. C. Niday, of Miami, Tri-State manager for the company. One of the shafts will be situated on the Owen land, five miles northeast of the company's Navy Bean mill, which is about three miles west of Wentworth, and the other will be on the Jasumback land, a half-mile southeast of the mill. Both shafts will be put down to a depth of 100 ft., where a zinc orebody has been determined.

▶Roy Kibler and associates, of Joplin, are developing a zinc and lead mine on the Mohaska lease, an 80-acre tract in the old Blendville mining area, near the intersection of 26th St. and Empire Ave. in Joplin.

TENNESSEE

New Orebody Being Developed at Copperhill

Tennessee Corporation finds encouraging results from prospecting—Program of modernization now completed

▶President E. H. Westlake of Tennessee Corp., in his annual report for 1940 stated that the consolidated report for the year shows operating profit and other income mounting to $2,222,900.95 and net profit after interest, taxes, depreciation, etc., of $1,159,136.87. Beginning with the fourth quarter of 1939 and continuing through 1940, operations at the company's two principal plants were approximately at full capacity, and this scale of operation continued through the first quarter of 1941. A considerable amount of prospecting was done at the company's property of Copperhill, Tenn., during the year, with encouraging results, and, notwithstanding that the tonnage of ore mined was the largest on record, ore reserves increased slightly during the year and were estimated as of Dec. 31, 1940, to be 9,230,006 tons.

▶An active campaign of underground development is in progress designed to prepare for mining a new orebody, no tonnage of which is included in the ore reserves as presently reported. Expenditures for capital improvements during the year 1940 amounted to approximately $650,000. The principal item was the cost of a new reverberatory furnace at the Copperhill smelter. The installation of this furnace brings to completion a construction program of modernization of metallurgical facilities which began with the erection of a flotation mill and the installation of roasters a number of years ago. This milling-roasting process treats more economically the high-sulphur, high-iron, low-copper ores which now predominate.

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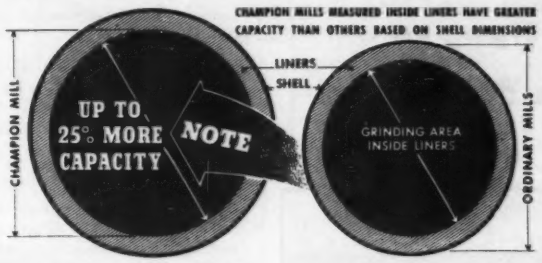

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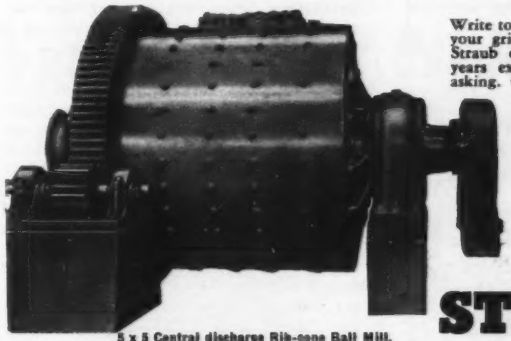

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Manhattan Dredging Company's big boat near Tonopah, Nevada, operated for the owners by the Natomas Company, uses 18 Pan-American jigs for gold recovery.

Primarily a jig recovery operation, the Manhattan dredge has 2 banks of eight 42" by 42" Pan-American Placer Jigs to work the 12,000 cy. handle, with two additional Placer Jigs of the same size for cleaners. The entire jig assembly and installation was designed by Pan-American engineers in cooperation with the dredge builders.

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MICHIGAN

Copper Mines Receive Less State Tax Valuation

Curtailment of advanced development due to 12c., ceiling for copper begins to influence State appraisal of ore-reserve value of properties

▶ Valuation figures of the copper mines of Houghton and Keweenaw counties, announced by the State Tax Commission, total $6,370,862, against $7,151,375 in 1940, a reduction of $780,513. The recommended valuation for Keweenaw County this year is $1,355,000, against $1,395,000 a year ago, which is a reduction of $40,000. Figures for Houghton County, including refined copper, are $5,015,862 this year, compared with $5,756,375 last year, a reduction of $740,513. The largest reduction was for the Calumet & Hecla reclamation project, which was cut $555,000. In submitting his recommendations for assessed valuation of the mining properties of the district, G. E. Eddy, State Appraiser of Mines, said in part: "The production for 1940 was 90,582,594 lb., which was an increase of 2,500,000 lb. over the 1939 output. Average output per mine was larger than during the preceding three years. The reason for the increased production was the higher price received for copper. Average price for 1940 was 11.79c., an increase of one cent above the price received during 1939 operations. The problem of the estimation of reserves and the valuation of the Michigan copper mines hinges entirely upon the price of copper. In times of high copper prices and good demand, naturally the reserves of copper are increased because the operators can afford to mine rock of lower grade. While it is perhaps true that the Michigan mines can make a profit on 12c. copper, this profit cannot be realized except at the expense of loss of reserves. By this it is meant that if the mines were to concentrate on straight stoping and not do any exploration or development work, the cost of operations would be below the selling price. This would be most unhealthy for these mines, as the maintenance of adequate reserves is of the greatest importance in the future existence of any mining district. Because of this fact, most of the Michigan mines are trying to maintain reserves by exploration, shaft sinking, and opening new levels."

▶ A letter from Leon Henderson, administrator of the Office of Price Administration in Washington, D. C., to B. D. Noetzel, managing director of the Isle Royale Copper Co., has encouraged the local copper industry to believe that some consideration will be allowed high cost copper products. Mr. Henderson stated that the Tariff Commission, whose representatives investigated mining costs in the Michigan district, had just submitted its report to him and that he would give it immediate attention. He stated that "in my judgment we shall very soon be able to reach a solution satisfactory to all parties concerned." Mr. Noetzel has been active as a member of the Michigan copper price commission appointed by Governor Van Wagoner. This committee met with the Tariff Commission representatives on their visit to Houghton.

▶ A total of 2,265 ft. of underground drilling was done in 1940 by Calumet and Hecla Consolidated Copper Co. in the lower levels of Ahmeek to explore the formations between the Wolverine sandstone and the Kearsarge conglomerate, in the footwall and hanging wall of the Kearsarge amygdaloid respectively. Nothing of interest was found in these drill holes. The commercial stoping area in No. 2 shaft will have been exhausted sometime during the latter part of 1941. There will remain a large reserve of valuable ore in the shaft pillars and in the unstoped levels left to keep the water out of the bottom of the mine. However, the maintenance of No. 2 shaft is essential for pumping, ventilation, and safety while No. 3 shaft is operating. It will therefore be necessary to stop production at No. 2 shaft until retreat has begun from the bottom of No. 3 shaft.

▶ Both the Lake Linden and the Tamarack plants operated throughout 1940 under normal conditions. Of the 1940 production 8,646,000 lb. was from table treatment, 17,251,000 lb. from leaching, and 3,785,000 lb. from flotation. At the Ahmeek mill there was stamped 731,403 tons of Kearsarge amygdaloid rock from the Ahmeek mine and 92,300 tons from the Peninsula Copper Co. territory. At Lake Linden the Hecla mill and sand wheels were scrapped. During the year the smelter department received 43,396 tons of concentrates and mass, and smelted 43,890 tons. From the material smelted there was produced 55,835,544 lb. of refined copper. Copper oxide shipped to customers amounted to 2,738 tons, containing 4,169,004 lb. of copper. While the billet-casting equipment, mentioned in last year's report, is not fully completed, of all the shapes cast during the year 51.6 percent were made in water-cooled molds, 39.2 percent being VC cakes and 12.4 percent being billets.

▶ During 1940 geological studies bearing on the problem of exploring the district, with special reference to Calumet & Hecla lands, were carried forward. Because of the prevalent cover of glacial material, bedrock relations are concealed over the greater proportion of the district. This makes it necessary to supplement the customary geological mapping by a considerable amount of diamond drilling. To this end, company lands are being covered by a preliminary network of diamond-drill holes. The study of the cores so obtained is yielding a mass of information enabling geological maps to be assembled in a way not otherwise possible. In 1940, 36,336 ft. were drilled, largely on surface in Houghton and Keweenaw counties. In addition to providing geological information of value, these holes encountered many copper showings, a few of which are sufficiently encouraging to justify further investigation.

▶ Coincident with the declaration of dividends in April, June and September, it was provided, in each instance, that each employee be paid a bonus equivalent to the dividend on 50 shares of stock.

IRON COUNTRY

Several Diamond Drill Programs Under Way

Future demand for iron ore moves producers to plan expansion of operations—Sherwood shaft passes half way mark

Marquette Range

▶Late in May, construction started on the new laboratory building and the addition to the drill repair shop and sample room of the Cleveland-Cliffs Iron Co., near Ishpeming. The laboratory will be quarters for Charles Hawes, chief chemist; Frank Linn, chief sampler; and chemists doing special work. About 35 persons are employed in the laboratory.

▶Iron-ore stockpiles totaling about 100,000 tons, at the Champion mine of the Oliver Iron Mining Co., have been acquired by the Cleveland-Cliffs Iron Mining Co. The ore will be screened and conveyed to bins and hauled by truck to Champion and then by rail to Marquette. The Champion has been idle since 1912.

▶The Cleveland-Cliffs Iron Co. has started a diamond-drilling program west of Rock Lake and east of North Lake mines. Another drill is operating at its Negaunee mine.

▶West of Ishpeming, on its Blueberry property, the North Range Mining Co. is diamond drilling to determine downward ore extensions.

▶Exploration by diamond drilling contracted by Duluth interests and the E. J. Longyear Co. is underway on the property of the Volunteer Mining Company, in the Cascade district.

Menominee Range

▶All iron-ore producers on the range have increased wages 10c. per hour, with corresponding adjustments of monthly salaries.

▶The new Sherwood shaft of the Inland Steel Co. is now advanced to below the 600-ft. level, or more than half the distance required for production. Mine development is advancing rapidly. R. D. Satterly is Menominee range superintendent of the Inland Steel Co. The large electric hoist for the Sherwood mine is being completed by the Lake Shore Engineering Co., Marquette, Mich., and Nordberg Manufacturing Co., Milwaukee, Wis.

Vermillion Range

▶The Vermillion Mining Co. recently started shaft-sinking operations at its Zenith mine, near Ely, Minn. Eventual depth of the shaft will be 1,200 ft., and from six to eight months will be required for its completion. Not far from this new site is the circular ventilation shaft bored to a diameter of 66 in. by steel shot in 1938. B. S. Richards is superintendent of the Zenith mine.

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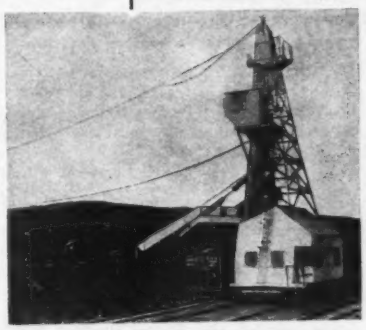

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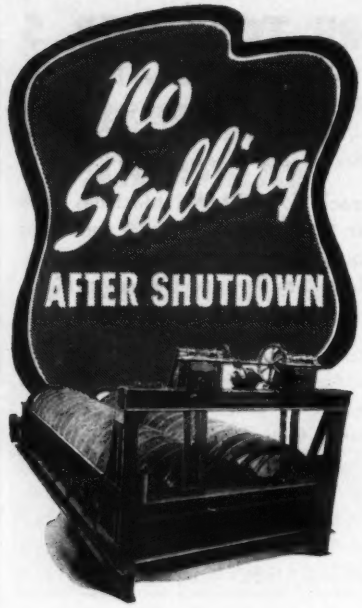

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MEXICO

Strike at Monterrey Lead Refinery Unsettled

Union announces it is ready to continue shutdown for four months if necessary—Governor of Durango assures one company of guarantees of authority to reopen property after being closed five years due to labor leaders' demands

▶ Mining in Mexico continued to hope for better times as spring drew to a close. High notes of the situation were the labor troubles of American Smelting. The national miners union partly put into effect the threat to close all the company's units by calling strikes against the Hidalgo del Parral, Chihuahua, unit and the lead refinery at Monterrey, Nuevo Leon (closed since April 27), to enforce its demands for higher wages and other concessions. Quick action of the government, however, settled the Parral conflict within a few days. But the Monterrey strike continues. The union announced that it is prepared to continue this strike for four months, if need be.

▶ After a suspension of work for five years because of difficulties with labor leaders, the Cia. Minera Santa Maria del Oro, S. A., Magistral del Oro, Durango, Murray F. Crossette, manager, is to resume operations early in June. Governor F. S. Velazquez of Durango assured the company full guarantees, including the curbing of the labor chiefs' activities, in an agreement for the new work. The company is to resume with a working personnel of 1,000 and will spend 2,500,000 pesos ($525,000) for reconditioning the property and building a road from its holdings to connect with the Mexico City and Hidalgo del Parral and Ciudad Juarez, Chihuahua, highway.

▶ Cooperativa Minera "15 de Octubre," a mining cooperative at Concepcion del Oro, Zacatecas, has reduced wages of its members by half because of poor business and has appealed to the state government and business men for monetary aid.

▶ Mexico has more than doubled her mercury production during the past year and is exporting nearly all of this output, most of it to Japan, according to a report of the Ministry of National Economy that this production increased to 57,778 kg. last January, against 25,577 kg. in January, 1940. Of last January's output, 57,433 kg. were exported to but two countries—Japan, 50,961 kg. and the United States, 6,472.

▶ Purchase of 1,000 kg. of Mexican mercury and a considerable quantity of this country's copper and zinc is sought by a Chinese syndicate, the ministry of foreign relations (foreign commerce department) learns from the Chinese legation. Assurance has been given that the Chinese buyers want this material entirely for commercial purposes and that it will not be used in any way in China's war program.

▶ Cananea Consolidated Copper Co., S. A., in Cananea, Sonora, Mexico, produced 28,195,380 lb. of copper, 310,258 oz. of silver, 16,150 oz. of gold, and 604 tons of molybdenite during 1940. The foregoing production includes 567,801 lb. of copper, 88,057 oz. of silver, and 6,929 oz. of gold produced from custom ores. Deliveries of copper amounted to 32,433,463 lb. Operating income amounted to $1,778,445.55 and other income to $19,132.40, a total of $1,797,577.95. Expenses during a strike at Cananea (April 5 to Sept. 11, inclusive) totaled $512,683.07. United States and Mexican income taxes (estimated) amounted to $42,568.37, provision for depreciation and obsolescence totaled $235,764.16.

▶ Amparo has installed a 40-ton plant to mill surface dumps. This mill is expected soon to increase the property's daily production to about 150 tons. This company recently overcame labor difficulties by granting a new collective contract which allows a general salary increase of 6 percent, and agreed to retain the entire working personnel. The national miners union had urged the labor ministry not to permit under any circumstance a reduction of pay or personnel by this company.

SOUTH AMERICA

Bolivia's Tungsten Ore Bought by Metals Reserve

Contract involves purchase of that country's entire tungsten output for use in the United States during next three years

The Metals Reserve Company on May 21 signed contracts with Bolivian producers, guaranteed by the Bolivian Government, for that country's entire production of tungsten ore, amounting to about 4,400 tons of tungstic oxide a year, for a period of three years, on the basis of $21 per unit, c.i.f. New York. Yearly purchases involve about $38,400,000. The deal starts July 1, 1941.

Contracts provide that the purchasing agreement may be renewed at the end of three years. The Metals Reserve has an option to acquire excess production. Deficiencies in output may be carried over from one year to the next.

As in copper imports, the Government pays the duty to itself and for all practical purposes the duty on tungsten of about $7.93 per unit of WO_3 becomes inoperative. The Government agency intends to make such ore as it does not stockpile available to consumers at present market prices, or approximately $24 per unit of WO_3.

PERU

▶ At the annual meeting of stockholders of Cerro de Pasco Copper Corp., operating in Peru, it was revealed that copper production is running at 5,500,000 to 6,000,000 lb. a month. In the future, it was stated, the company expects to have as large a business in lead and zinc as in copper. Lead production in the first three months of 1941

amounted to more than 17,000,000 lb. The company will complete its new lead-zinc concentrator in about a year, and new refinery facilities at a later date. Reserves of lead-zinc ores are estimated at about 18,000,000 tons, of which one-half is high grade.

ARGENTINA

▶The Aguilar mine, in the Province of Jujuy, Argentina, was operated at the rate of approximately 800 metric tons of ore per day during 1940. The 1940 capital expenditures amounted to 1,037,-158.50 pesos, which is equivalent to $242,351.20 at the rate of exchange prevailing during the months of such expenditures. Cash receipts not required for capital and operating expenditures were used to liquidate the open account between the Cia. Minera Aguilar, S. A., and its parent company, the Aguilar Corp. With funds so received, the Aguilar Corp. in May purchased 4,250 shares of its preferred stock and 1,930 shares of its common stock for $797,-406.26, and in October, an additional 1,691 shares of its preferred stock for $322,206.52; an aggregate cost of the shares purchased of $1,119,612.78. Of this amount, St. Joseph Lead Co. received $739,187.82 for 3,919 shares of preferred stock, thereby reducing its investment in Aguilar Corp. from $1,515,-000.00 to $775,812.18. As a result of these transactions the ownership by St. Joseph Lead Co. of the total outstanding capital stock of Aguilar Corp. increased from 86 percent to 89 percent.

CHILE

▶Chile Exploration Co., the operating subsidiary of Chile Copper Co., of Chuquicamata, produced 332,886,586 lb. of copper in 1940 and deliveries of copper were 338,526,363 lb. The operating income for the year was $22,486,092.70, and other income was $29,097.77, a total of $22,515,190.47. Deductions from income of $149,925 for interest on serial notes, and of $5,716,725.17 for (estimated) United States and Chilean income taxes, amounted to $5,886,650.17, leaving a balance of $16,648,540.30. Provision for depreciation and obsolescence was $2,719,324.27, and the resultant consolidated net income (without deduction for depletion) was $13,929,216.03, compared with $10,533,377.27 for the prior year, according to the annual report of the company.

▶Production of copper in 1940 by the Andes Copper Mining Co., from its properties 75 miles east of the port of Barquito, Chile, totaled 160,788,782 lb. Silver output was 408,201 oz. and gold production totaled 20,026 oz. Except for a two-day interruption on account of severe snowstorms, both oxide and sulphide plants operated continuously throughout the year. Copper deliveries were 163,187,412 lb. The operating income for the year was $7,430,882.30, and other income $319,021.84, making a total of $7,749,904.14. United States and Chilean income taxes (estimated) amounted to $1,763,907.88; and provision for depreciation and obsolescence was $1,723,977.99; a total of $3,487,885.87.

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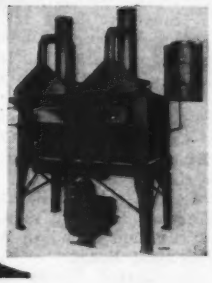

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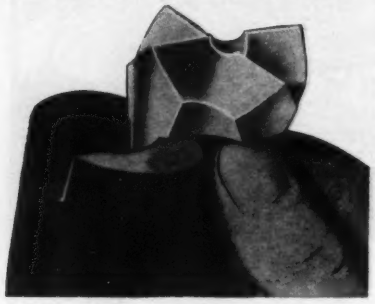

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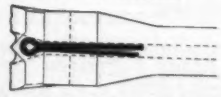

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CANADA

Siscoe Gold Mines Plan Mill Increase

Improvement in ore reserve position encourages company to raise about 200 tons daily this summer—British Columbia's mineral output establishes new high in 1940. Gold dredges may enter B. C. duty free.

▶ A mill increase of upwards of 200 tons by midsummer is planned for Siscoe Gold Mines, operating near Val D'Or, northwestern Quebec. This step follows the rapid increase in ore reserves within the last three months, estimated at more than 700,000 tons. With production expanded to more than 850 tons daily, the new program calls for stabilizing production and profits and lowering costs. Grade may be lowered to $3 a ton in sections along the main zone and on the upper levels of the "20" zone, to allow mining greatly increased widths. Since 1929 the Siscoe has produced $18,000,000 and, with the working out of the new ore theory, there is promise of greatly extending the life of the mine.

▶ National Malartic Gold Mines has arranged for joint financing by Hollinger Consolidated Gold Mines and Noranda Mines, by which National shares are to be sold to net $148,750 for development work. After exhausting this fund, National Malartic would be reorganized and new shares optioned to provide an additional $934,500. G. H. Rainville, president, announces that a shaft is to be put down to 725 ft. between the north and south ore zones. A drive is to be put through from the adjoining Sladen Malartic on the 725-ft. level, and drifting from the new shaft is to be carried out on the 325 and 525 levels. James P. Norrie is consulting engineer.

▶ Last year's operating profits at Francœur Gold Mines amounted to $219,737, and for 1941 the indications are that profits will exceed $300,000. In the final quarter, recovery averaged $6.92 a ton, with costs, including taxes, estimated at $3.15 a ton. John Knox, Jr. is mine manager and Alderson & MacKay are consulting engineers. The mill treats 180 tons daily.

Joint Materials Committee For U. S. and Canada

THE United States and Canada, through the creation of a new joint committee, are now in a position to cooperate fully in exchanging vital information on their supplies of strategic raw materials, it was announced May 14 by William S. Knudson, Director General, Office of Production Management. The new agency is to be known as the Material Coordinating Committee—United States and Canada, and is staffed as follows:

For Canada—G. C. Bateman, Canadian Wartime Industry Control Board; H. J. Symington, Canadian Wartime Industry Control Board.

For the United States—E. R. Stetinius, Jr., Director of Priorities, Office of Production Management; William L. Batt, Deputy Director of the Production Division, Office of Production Management.

Creation of the committee followed a number of conferences and discussions of the need for such an agency and the mutual advantages to be gained by the free exchange of information on raw materials available in each nation.

ONTARIO

▶ International Nickel Co. of Canada reports earnings in United States funds of $9,239,709 for the first quarter of 1941, after provision for taxes, depreciation, and depletion. This is slightly higher than in the final quarter of last year, but is lower than the first quarter in both 1939 and 1940, when taxes were almost 50 percent less. Current assets of $102,971,832 are well above a year ago, as is the net working capital, at $76,920,900. "Machine tools are indispensable to our industrial progress," reports R. C. Stanley, president, "and are the only machines which perpetuate themselves. The wider use of alloy steels has resulted in machines of greater accuracy." Nickel steels are used by almost all machine tool producers. John C. Nicholls, of Toronto, is assistant to the president and Donald MacAskill, of Copper Cliff, is vice president and general manager of mines.

▶ Shenango Mining Co., operating near Oba, plans large-scale development work,

according to a statement by the president, Louis Normandin, of Toronto. Surface work will include trenching along the south zone. The shaft is to be deepened from 125 to 375 ft. and two more levels are to be opened. The No. 2 and No. 3 veins will be explored underground to check high gold values shown on surface. Gordon Pollard is mine manager.

▶Lower profits and higher costs are reported by Young-Davidson Mines, gold producer in the Matchewan area, from which Hollinger collects 80 percent of the net profit. In 1940, underground mining accounted for 321,669 tons of ore and 46,578 tons came from pit operations, which are now terminated.

▶Leitch Gold Mines, operating 5 miles from Beardmore, reports first-quarter profits at $64,958, compared with $53,358 in the final quarter of 1940, due to lower operating costs and an average increase in grade from $29.62 to $29.80 a ton. A. D. Dickson is mine manager and Walter E. Segsworth, consulting engineer.

BRITISH COLUMBIA

▶Decision by the Canadian Government late in May to admit duty-free all sizes of dragline gold dredges, prospecting drills, bulldozers, and diesel engines from the United States for use on gold placer areas in British Columbia is expected to stimulate future gold production in several parts of the Province. The British Columbia Chamber of Mines, under the management of Frank Woodside, has been campaigning for this concession for the last three months and recently was advised of the favorable decision by the Hon. Thomas Crerar, Federal Minister of Mines and Resources. Dragline gold operators in the Western States seeking new mining areas are now believed willing to transfer their equipment from exploited areas to virgin gold fields in British Columbia.

▶British Columbia established an all-time record for mineral production during 1940, with a total value of $75,352,730, which exceeds the 1939 value of production by $9,700,000 and is more than $1,000,000 higher than the previous peak year of 1937. Lode mining produced 574,366 oz. of gold, valued at $22,113,091 and placer mining contributed 39,067 oz. of gold, valued at $1,236,928. Mercury, during 1940, formed a substantial part of the mineral output for the first time. Details of base-metal production are withheld by reason of Dominion regulations, but it is understood that practically every department showed increased values.

▶The Dominion Government has announced that the retroactive feature of the increased Excess Profit tax has been eliminated and this brings relief to several British Columbia mining companies, the fiscal year of which expires in 1941. The operators also feel that the Provincial Government is to be commended for acceding to the request of the Dominion and withdrawing from the income tax field. Relief from payment of the provincial levy on income, or its alternative, the mineral tax, would practically

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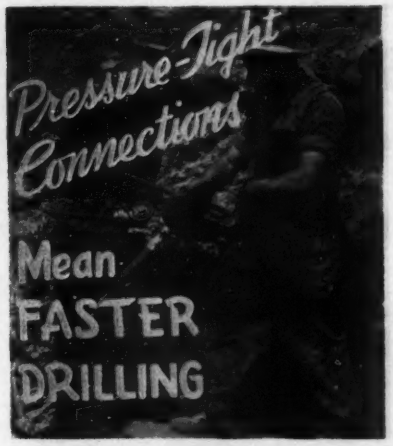
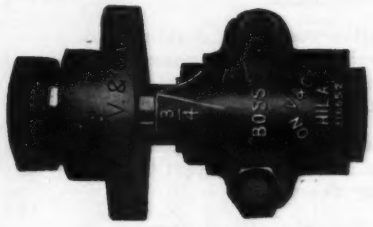


"GJ-DIXON"
GROUND JOINT
AIR HOSE COUPLINGS

A tight, leak-proof grip on the hose, plus the advantage of ground joint, washerless construction, makes the "GJ-DIXON" one of the most satisfactory and economical air hose couplings you can buy. Furnished with either male or female spud. Cadmium plated — rust-proof. Compact Type, Style XLD-41, ½" and ¾". Heavy Type, Style XHD-52, ¾" and 1".



"GJ-BOSS"
GROUND JOINT
AIR HOSE COUPLINGS

The strongest and most efficient of their kind. Same design and construction as "GJ-DIXON" described above, plus the extra strength and gripping power provided by the sturdy malleable iron "BOSS" Clamp, extended fingers of which engage collar on coupling stem. Cadmium plated—rustproof. Compact Type, Style XLB-61, ½" and ¾". Heavy Type, Style XHB-72, ¾" and 1".

Carried in Stock by Leading Rubber Manufacturers and Jobbers.

DIXON
VALVE & COUPLING CO.
MAIN OFFICE and FACTORY: PHILADELPHIA, PA.
Branches: Chicago • Birmingham • Los Angeles • Houston

▶CANADA

compensate for the increase in the excess profit tax, thus ensuring no reduction in output as a result of an increase in costs from excessive taxation. If the mineral tax, which has been accepted as part payment of the provincial income tax, is permitted to remain, operators in British Columbia would be placed in a most unfavorable position compared with those in other provinces, where no such tax is imposed. The Mining Association of British Columbia has made representations to the British Columbia Government, requesting relief from the mineral tax. While the matter has received a sympathetic hearing, no announcement has yet been forthcoming.

▶ Pioneer Gold Mines of B. C., Ltd., reports income for the fiscal year ended March 31, 1941, at $2,084,373. Profit before taxes amounted to $1,043,774 and net profit for the period was $720,047. A satisfactory comparison cannot be made with the previous year, owing to the strike which closed operations for a period of five months. However, both value of production and profit before taxes were greater than in the fiscal year of 1939, the last year of full production. Net profit was lower, owing to substantially increased taxation. Dr. H. T. James, managing director, states: "Although tonnage was below average for the first quarter, operations for the balance of the year were on a very satisfactory basis, and at the year's end the value of bullion produced was slightly in excess of that for the year ended March 31, 1939."

▶ Island Mountain Mines Co., Ltd., has purchased the Myrtle group of claims in the Cariboo mining district and a portion of the adjoining Shamrock group. F. W. Guernsey, president, states: "It is proposed to erect a development plant promptly at the portal of this tunnel, enlarge the present tunnel to permit adequate ventilation and haulage, and then drive approximately 2,300 ft. to cut the Rainbow member approximately 850 ft. below the surface. A minimum of 4,000 additional feet of development and considerable diamond drilling will then be necessary to prospect the Rainbow and Lowhee members within the 4,500 ft. of strike length within the property limits."

R.F.C. Loan to Canada for 170,000 Tons of Aluminum

THE Reconstruction Finance Corporation has advanced $25,000,000 to the Aluminum Co. of Canada in a deal to acquire 170,000 tons of aluminum. The total sum involved in the agreement announced May 16 by Jesse H. Jones, Federal Loan Administrator, is $63,000,000. The first installment will be used chiefly for plant expansion.

Production of aluminum in Canada has increased under war conditions, but figures on output since 1939 have not been released by the Canadian authorities. Data for 1939, however, showed that Canada's output in that year amounted to 75,000 tons.

The Aluminum Co. of Canada is the only Canadian producer of the metal, with plants at Arvida and Shawinigan Falls, Quebec. Cheap electric energy has attracted the industry to Canada. Bauxite, the ore of aluminum, is not produced commercially in Canada and all of the raw material must be imported, largely from British Guiana.

AFRICA

High-Grade Gold Confirmed in West Rand

Strike of two-ounce ore made in shaft at 4,615 feet—British-controlled mining adjusting itself to demands of war effort

▶ The Witwatersrand latest sensation was caused by the intersection by the Blyvooruitzicht Gold Mining Co., at a depth in its shaft of 4,685 ft., of the so-called Carbon leader, which so far has proved to be important only in West Rand areas. At the point cut it assays 40.3 dwt. over a width of 27.4 in. This extraordinary value for the Witwatersrand is the average of 20 samples taken over as many sections. These varied from 2.45 dwt. over 27 in. to 113 dwt. over 31 in. This is taken to be something more than a full confirmation of the excellent cores obtained when the property was drilled.

▶ British-controlled mining industry has adjusted itself to war conditions by economizing in every possible and practicable way, by increasing production so far as may be, and by preparing to yield gracefully to any and all demands made upon it by the taxation authorities. The romantic side—taking one in ten chances of finding ore and financing exploration and prospecting campaigns—has been walled off for the time being. That wall will remain while the mining industry is helping the British Empire complete the big job it has undertaken. Inability to finance will cause some development enterprises to be abandoned—is already doing so—and the properties will await refinancing after the war.

▶ Transvaal mines produced in 1940 (this includes outside mines with those of the Witwatersrand) 14,000,000 oz. of gold, valued at £118,000,000. Both are new high records. Only two or three years ago it was being said that the Witwatersrand would soon have production stabilized at 1,000,000 oz. per month, and it is now far beyond that amount.

▶ In the speech delivered when retiring as president of the Transvaal Chamber of Mines, P. M. Anderson expressed grave concern as to the effect of South Africa's decision to tax the dividends paid to overseas holders of gold-mining shares a shilling in the pound. He said that of eleven potential new gold producers seven had (because of the financial situation produced by the war) suspended operations and could resume only with the aid of overseas capital. Such capital, he believed would be far less readily obtainable because of this taxation.

▶The size and grade of the orebody in the deep levels of the Ashanti Goldfields mine was further proved by last year's development work. It was reported a year ago that on the 28th level it had a length of 100 ft., a width of 34.5 ft. and a value of 13.6 dwt. This has now been extended to a length of 350 ft. and over an average width of 38 ft. values average 22.8 dwt., and the full extent has not been determined. On the 31st level the length exposed has been extended meanwhile from 275 ft. to 500 ft., the width over this greater length being 20 ft. and the average value 32 dwt. Intervening levels remain to be developed. The management believes Ashanti Goldfields will be able to continue the present monthly treatment of 19,000 tons of ore for the production of 22,000 oz. of gold during the present year.

▶In some quarters it has been feared that the great numbers of men needed for the forces would deplete mining labor supplies and restrict production. So far there is no indication that this is happening. Though Gold Coast and South African natives have figured largely in the fighting in northern and northeastern Africa, the gold production of the two areas is being well maintained.

AUSTRALIA

Quicksilver Mining Increasing in Queensland

Old mercury properties being reopened—Mount Morgan, Ltd., plans to erect copper refinery to treat blister produced in Chillagoe district

▶Quicksilver mining continues to make progress in the Kilkivan district, where the increasing need for the metal has stimulated the reopening of old workings and the prospecting of new ground. Since the Q.S. Mines, N.L., commenced exploratory work, ore from development has been reported and 226 tons has yielded 2,272 lb. of mercury, which realized £A2,085, equivalent to £9 4s. 6d. per ton. Work has not yet progressed below the 100-ft. level, at which horizon the latest reports state that rich ore is being opened up.

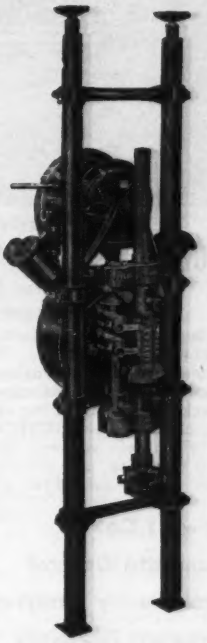
▶Mount Morgan, Ltd., plans to erect a copper refinery near the mine. At present blister copper is forwarded to the refinery of Electrolytic Refining & Smelting Co. of Australia, at Port Kembla, on the south coast of New South Wales. With increasing production of copper in Queensland, there is need for another refinery. Copper ore is mined on the Cloncurry field, to the northwest, and in the Chillagoe district, still further north. This ore is smelted at the government smelter at Chillagoe, and a refinery at Mt. Morgan would be well placed to treat the blister copper from this centre.

WESTERN AUSTRALIA

▶Youanmi Gold, Ltd., which is operating in the Black Range gold field, near

UNDERGROUND PROSPECT DRILLING?
USE MODEL BBU-1 DIAMOND DRILL

Light for Easy Handling—Powerful Enough for Depth Exploration



When drilling requirements vary from short holes of 100 feet to maximum of 900 feet BBU-1 is the drill. Light enough to handle easily for any mine work—sufficiently powerful for depth exploration. Rugged compressed air motor has lots of stamina—Model BBU-1 has proved itself in mines throughout the world.

Write for bulletin. Prompt attention to enquiries whether for sales or contract.

BOYLES BROS. DRILLING CO., LTD.

Diamond Drilling Contractors and Manufacturers

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TAMPCOT

Cuts Powder Costs
-SAVES WORK

You can save up to 25% on powder—save countless man-hours of work with this new and modern stemming material. For Tampcot costs less than 1¢ per hole, yet it is scientifically designed to form a tight confining seal in front of the powder charge, thereby increasing the blasting force of your powder. No more waste labor on hauling and mixing clay for stemming. Uniform, fireproof, and non-inflammable, Tampcot is the new development that means efficiency in operations. Break more ore with less powder. Use Tampcot stemming.

NATIONAL AUTOMOTIVE FIBRES, INC. Oakland Division
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***TAMPCOT* — formerly known as Calcot Tamping**

Panoche Quicksilver Mines Co., San Benito County, California

GOULD ROTARY FURNACE AND CONDENSING SYSTEM

From 5 to 200 Tons daily capacity

THE STANDARD OF QUICKSILVER REDUCTION EQUIPMENT

Each unit of any Gould plant is designed for, and built to, the demand of the job it has to perform. The Gould plant is not a stock job but one which is engineered for each application after individual characteristics of ore and operating conditions have been carefully studied. As operators of several of the largest quicksilver mines in the country, our plants are being constantly tested, improved on, checked and RE-CHECKED!

Let us help you with your plant requirements, let us design your plant—erect it if you wish, and provide a capable operator to get you started: let us provide you with a quicksilver plant which is recognized as standard the world over!

Lowest Costs
Accurate Control
Individually Designed
Greatest Flexibility

H. W. GOULD & CO.
MILLS BUILDING
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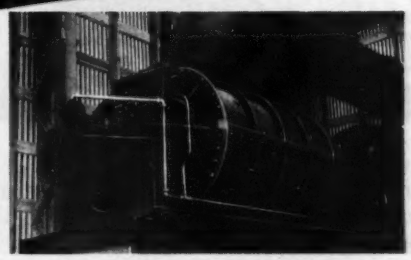
POSITIVE DISPLACEMENT

Puts AIR and GAS where you want it.



One of four 17,500 CFM motor-driven Blowers furnished for tunnel ventilation on Delaware Aqueduct.

With motor-driven Positive Displacement Blowers and Gas Pumps, air or gas is put to work where you want it with a minimum expenditure of power. One of the characteristics of this type blower is that it takes horse power in direct proportion to the pressure built up by the external resistance.

IN HANDLING AIR AND GAS *Experience Counts*

Roots CONNERSVILLE BLOWER CORPORATION

106 Washington Ave. Connersville, Indiana

NEW YORK CHICAGO POTTSTOWN, PA. SAN FRANCISCO
DETROIT ST. LOUIS LOS ANGELES PITTSBURGH BOSTON

▶AUSTRALIA

Sandstone, has issued accounts for the year ended June 30, 1940, which disclose a profit of £9,297. Ore reserves have increased by 55,194 tons, to 192,450 tons of an average grade of 7.1 dwt. per ton.

▶ Paringa Mining & Exploration Co. Ltd., Kalgoorlie, reported an increase in the recovery of gold for the year ended Aug. 31, 1940, of 4,923 oz. from the treatment of 20,761 tons more ore. The production for the year was 91,195 long tons of ore, which yielded 21,399 oz. of gold. The head value of the ore was 5.348 dwt. per ton and the average assay value of the residues was 0.6 dwt. per ton. Ore reserves have been increased considerably and are now 461,687 long tons, having an average value of 4.91 dwt. per ton, sufficient for 4½ years' production with the present mill capacity.

▶ During 1940, Big Bell Mines, Ltd., at Big Bell, near Cue, carried out a development program totaling 15,713 ft. The lode has been proved of economic value for a length of 1,500 ft. and varies in width from 80 to 100 ft. The dip is east at 73 deg. and ore is mined by glory hole to a depth of 200 ft., the overburden on the hanging wall being stripped by an electrically operated dragline. Below a depth of 200 ft., the deposit is being prepared for sublevel caving and ring drilling. The company has done much excellent social and welfare work and has given its employees living conditions of a high standard. The most recent addition to the well-being of the community is a modern hospital.

NEW SOUTH WALES

▶ For the year ended Dec. 31, 1940, the gold yield for the State was the highest since 1916. Output for 1940 was 100,255 oz. gold, valued at £A1,068,753. In the previous year the production was 87,189 oz., worth £850,622.

▶ Lode tin mining is carried out in two widely separated districts, Torington, in the north, and Ardlethan, in the centre of the State. On the Torington field two mines have been in steady production for some years, the New England Tin Mines and Curnow's Tin Mines. A new company, the New Butler's Tin Mines, is completing the erection of hoisting and mining plant preparatory to commencing development.

TASMANIA

▶ Following on recommendations by H. J. C. Conolly, made after a thorough geological examination of the central portion of the Mt. Lyell field, a comprehensive diamond-drilling campaign is in progress to test the possibilities of the area.

▶ King Island Scheelite, N. L., King Island, may use the flotation process to improve recoveries, according to an announcement at the annual meeting of the company.

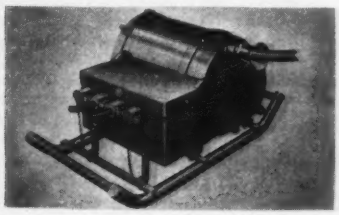
EQUIPMENT NEWS

Continuous Feed Drifter

AN IMPROVED, automatically-fed drifting drill, recently announced by the Gardner-Denver Co., of Quincy, Ill., and known as the CF89H continuous feed drifter, has the feed motor built into the drill proper. This construction is said to add weight to the drill rather than to the mounting, and aids in absorbing recoil. Because of reduced vibration, the manufacturer states, the CF89H drifter operates with smoother action, greater drilling speed and lower over-all maintenance. A slowly moving piston motor—approximately 30 strokes to each 12 in. of drill travel—explains the long life and low air consumption of the drill, it is claimed. The feed throttle controls the direction of feed as well as power and speed. Feed throttle and drill throttle are conveniently located in the drill back-head, where they are always within easy reach of the drill runner, and do not invite the destructive practice of returning drill on a full head of air. In either hard rock or in easy drilling formations, the drill is said to be always held in proper relation to shank for highest drilling efficiency. Over-all length of mounting is less than a crank-fed mounting of corresponding steel change, which, the maker claims, permits maximum pitch of cut holes in drilling the round.

Multiple Distribution Box

OHIO BRASS CO., Mansfield, Ohio, announces the development of a new gas-proof multiple distribution box bearing the approval plate of the U. S. Bureau of Mines. The device, designated as the Type GM distribution box, consists of a gas-tight compartment containing a double-pole disconnect switch and a fuse panel, and a plug compartment containing four three-conductor rubber plugs. The lid of the plug compartment, as well as the screw cover of the compartment, is interlocked with the switch, so that it is impossible to remove a plug or change a fuse with the power on. When the cover is off the switch is in open position and is inoperative.



This distribution box is said to provide a safe and convenient means of connecting and disconnecting face circuits to conveyors, blowers, drills, hoists, and other electrical equipment. It also provides positive overload protection for each of the four circuits. One plug circuit is arranged for a 300-amp. fuse. Two are arranged for 60-amp. fuses. The fourth circuit is arranged for a 30-amp. fuse.

High-Speed Mobile Crane

COMBINING THE SPEED of a Tournapull and the lifting power and maneuverability of a tractor Crane, R. G. LeTourneau, Inc., Peoria, Ill., introduces its Tournacrane. Boom lengths of 20, 30, and 40 ft. and a lifting capacity of 10 tons fit the unit to a wide variety of jobs—unloading flat cars, erecting steel, stacking material in warehouses, placing concrete reinforcement on paving jobs, and similar handling of large, awkward, and heavy loads. Traveling speeds, are said to be up to 14 miles per hour.

One of the main features of the Tournacrane is said to be its quick, easy interchangeability with other tools of the manufacturer, such as Carryall scrapers and Tournatrailers. Only one power investment is necessary to handle lifting, hauling, and earth-moving jobs. Fifteen or twenty minutes are said to be required to convert a high-speed, rubber-tired Tournapull from earth-moving with Carryall scraper to a wide-range, lifting tool.

Portable Compressor With Convertible Engines

INGERSOLL-RAND CO., Phillipsburg, N. J., recently announced a new line of portable air compressors which, in addition to providing features never available before in a Portable, are claimed to reduce average fuel costs up to 40 percent compared to previous I-R models. These new machines have a new name, "Mobil-Air," which the company has selected to symbolize these units. In the K-series compressors, Ingersoll-Rand offers the first portable compressors ever available with engines convertible from gasoline to oil or from oil to gasoline operation by making a simple substitution of fuel accessories and without changing heads or pistons. This engine is the Waukesha Multi-Fuel engine built to Ingersoll-Rand specifications. On gasoline it operates as a new type high-economy engine and employs the same high-turbulence combustion chamber used in the Type H oil engine. It is claimed that this results in a low fuel consumption, particularly at part loads. On fuel oil, the engine operates like the familiar easy-starting, low-compression Hesselman type. Another feature is the patented Drill-More Multiple-Speed Regulator which is said to adjust the engine speed automatically to the use of air and practically eliminates wasteful idling while air is being used.

One of the nine new Westinghouse 125-ton, 1,520-hp. combination trolley-battery electric locomotives for the open-pit Morenci mine of the Phelps Dodge Corporation in Arizona. These locomotives are equipped with Exide ironclad storage batteries and are the largest electric locomotives ever built for open-pit mining. Designed for standard-gage track, each unit will have a continuous tractive force of 41,600 lb., and all are expected to be in service later this year, eventually hauling about 25,000 tons of copper ore each day

LOW-COST MATERIAL HANDLING

Jeffrey - Traylor electric vibrating grizzly feeder 24" wide — 48" long. 7 widths — 8 lengths. Handles 3 ft. cubes to dust.

Jeffrey-Traylor grizzly feeder discharging 250 tons per hour to picking belt conveyor. Separation at 3" and fines are by-passed crusher. Also open or totally enclosed pan feeders.

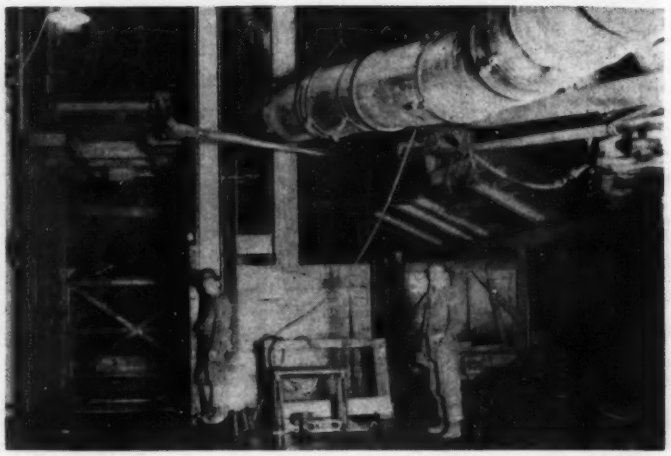
Jeffrey-Traylor reverberatory charging vibrating conveyor equipped with 22 Quick-acting discharge gates — permits rapid charging of furnace. No mechanical wearing parts.

Battery of J-T single deck screens used to by-pass fines in conjunction with crushers and rolls.

Jeffrey-Traylor (patented) units provide low cost handling — positive control over tonnage — use balanced high frequency vibration under absolute control. Send for Catalog No. 650.

The Jeffrey Manufacturing Co.

974-99 North Fourth Street, Columbus, Ohio



Lock Joint Pipe Co., Ampere, N. J., announces a steel air-tight, self-centering jointed, ventilating pipe in various sizes for use in underground operations, as shown above

New Type Conveyor Belt

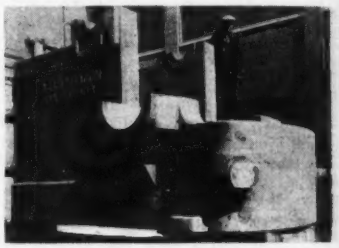
A NEW TYPE of conveyor belt called Homocord has recently been introduced by The Manhattan Rubber Mfg. Division, Passaic, N. J. The new conveyor belt is said to combine the extreme flexibility of cord construction with the ability to hold metal fasteners to a degree previously approached only by fabric construction and with added qualities which notably increase life and tonnage capacity of conveyor belts.

The construction, which is said to employ neither standard weave nor standard cord design, was the outgrowth of progressive studies of the causes of failure and of ways to overcome them. The characteristics of this new belt are said to meet adequately every demand of conveyor-belt service in the correct proportioning of lengthwise and crosswise strength and flexibility, low inelastic stretch, resistance to fatigue and impact, equal life in body and cover, and other essential qualities.

Respirator

A NEW RESPIRATOR, said to provide increased comfort and fully efficient protective features, is announced by Chicago Eye Shield Co., 2362 Warren Boulevard, Chicago, Ill. Called the Cesco No. 94 Healthguard Respirator, the unit carries a recently issued approval by the U. S. Bureau of Mines (approval number BM-2142), for protection against Type A (silica), lead, and nuisance dusts. An improvement claimed for the new respirator is the manner in which the soft-moulded rubber face-piece fits low on the nose. This feature is said to eliminate obstacles to vision and enables the user to wear spectacles or goggles in conjunction with the respirator.

Operating features include a specially designed metal filter box that guards replaceable filters, with an over-all filtering area of approximately 40 sq.in. to promote easier breathing. Newly designed exhale valve incorporates a speaking diaphragm to permit a normal exchange of conversation.



About 75 tons of Meehanite metal were melted for the casting of this large 68-ton jaw crusher at the foundry of Farrel-Birmingham Co., Inc., Ansonia, Conn.

Perspiration Retainer

THE MINE SAFETY Appliances Co., Pittsburgh, Pa., announces its new M.S.A. Coolband—a perspiration retainer for men working in hot places. The band is said to prevent sweat in the eyes, and on goggles or glasses, and stops continual face-mopping and other deterrents to continuous work arising from uncontrolled head perspiration.

It consists of a soft, flexible band which encircles the head—clinging softly without binding, and creating a cooling effect through constant absorption of perspiration. Sanitation is said to be easily maintained, and the band may be disinfected at will. Any part of the band can be quickly and easily wrung out.

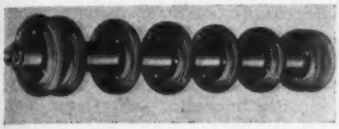
Motor-Operated Secondary Controllers

FOR USE with polyphase wound-rotor motors on fan, pump, and similar drives, a new motor-operated secondary controller is announced by Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. This controller provides either 13 or 20 balanced points

of control by varying the external resistance in the motor secondary winding. Enclosed in a self-supporting steel cabinet, the unit has cam-actuated contactors arranged for sequential operation in pairs from a common motor-driven camshaft. Individual cams give "quick-make" and "quick-break" contact action. Pure silver inlays on contact surfaces assure excellent current conductivity and avoid heating due to oxidation of the copper base. The motor may be supplied for 115 or 230 volts d.c. and 110, 220 or 440 volts, a.c.

Rubber-Tread Return Idler

THE DEVELOPMENT and manufacture of a new line of rubber-tread idlers for supporting the return run of 14- to 60-in. wide belt conveyors is announced by Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind. Each complete idler



consists of from four to twelve 6-in. diameter rubber-tired rolls suitably spaced and mounted on a Friction Fighter roller-bearing-equipped steel tube that will fit into the same supporting hangers as the regular Link-Belt return idler roll. The new idlers are offered for conveyors handling corrosive, abrasive, wet, or sticky materials, as the kneading action of the rubber treads keeps the material from building up, and also helps to break up and loosen ice forming on the belt in freezing weather.

Power-Control Winches

A COMPLETE LINE of single and two-drum power-control winches for operating, cable-controlled equipment with International TracTracTors and other tractors is announced by Bucyrus-Erie Co., South Milwaukee, Wis. According to Bucyrus-Erie engineers, the enemy of dependable winch operation is excessive heat, and they claim this has been routed in the design of the new Bucyrus-Erie planetary-drive winch. Clutch and brake drums are separate and each drum has but one heat-generating surface; bands are external and contact 93.8 percent of the full circumference of the drum, spreading friction pressures over a large area so that less heat is generated at any one spot. All bands and drum friction surfaces are exposed to open air to assure prompt heat dissipation.

New Arc-Welding Electrodes

THREE NEW shielded-arc electrodes, Types W-30, W-83, and W-93, for specific types of arc-welding work, have been announced by the General Electric Co., Schenectady, N. Y. All three types are heavily coated and will operate on either direct or alternating current.

The Type W-30 is an A.W.S. E-6012 all-position electrode, especially designed for automotive and piecework industries where high currents are desired for high-

FOR TOUGH MAIN LINE HAULAGE SERVICE . . .

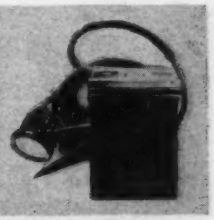
ATLAS TYPE "A"

STORAGE BATTERY LOCOMOTIVE

Assure efficient, low cost service on your heavily trafficked main line haulage ways with ATLAS Type "A" locomotives. They come in 3 and 4-ton sizes, with 18 in. track gauge standard, but can be provided in any desired size for wider gauges. Design and construction are of the highest quality, with the Patented ATLAS Double-Reduction Spur Gear Drive included. These storage battery locomotives, besides showing very low maintenance cost, are guaranteed to do more work on a single battery charge than any locomotive on the market of like weight and battery capacity. This better locomotive should be working for you now . . . write today for details.

THE ATLAS CAR & MFG. CO.
1150 IVANHOE RD. CLEVELAND, OHIO

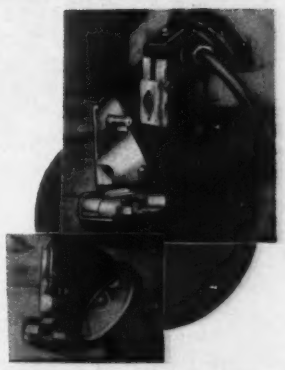
WHEAT for BETTER LIGHT



Engineered for EASY CHARGING
Self-Service in the Lamp House

No need to take this lamp apart to charge. Nothing to disconnect on battery, headpiece or cord. Just slip keyhole in headpiece over key in charging rack—give it a twist of wrist and charging starts. Twist in opposite direction stops charge, releases lamp, leaves all contacts dead. Foolproof! This simplicity also means great space-saving in Lamp House.

SAFEST—BRIGHTEST—LIGHTEST



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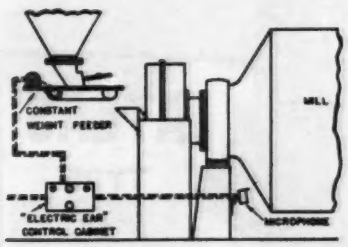

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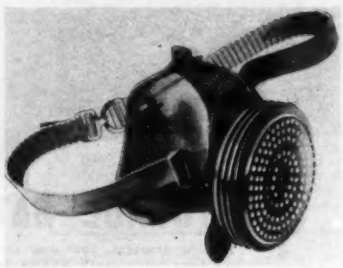

The new Willson bantam respirator, of the Wilson Products, Inc., Reading, Pa., is said to be the lightest-weight throw-away filter-type respirator yet to receive the United States Bureau of Mines approval. The respirator is said to be so light in weight and so easy to breathe through that it can be worn for long periods of time without causing any noticeable discomfort or slowing down of the worker. From headband to exhaust valve it is a completely rugged assembly

New Insulating Firebrick Line

A NEW LINE of insulating firebrick for the temperature range from 1,600 to 2,600 deg. F. is announced by Johns-Manville, 22 East 70 St., New York, N. Y., designed for direct exposure in a wide variety of furnaces, ovens, and other heated equipment, except where subject to slag action or mechanical abuse. The brick are furnished in four temperature limits: JM-16, for exposed service to 1,600 deg. F. and for back-up service to 2,000 deg. F.; and JM-20, JM-23, and JM-26 for exposed or back-up temperatures to 2,000, 2,300, and 2,600 deg. F., respectively. The new line supplements the Johns-Manville Sil-O-Cel series of back-up insulating brick for temperatures of 1,600, 2,000, and 2,500 deg. F.

BULLETINS

Distribution Transformers. Allis-Chalmers Mfg. Co., Milwaukee, Wis. Bulletin 6125 describes and illustrates the manufacturer's distribution transformers ranging from 37½ kva. to 200 kva. designed for standard voltages of 2,400 to 69,000 v Pp. 16.

Earthmoving Equipment. R. G. LeTourneau, Inc., Peoria, Ill. Catalog A-11 is a well-illustrated catalog of the company's complete line of earth-moving equipment. Pp. 48.

Corrosion-Resisting Steel. Bethlehem Steel Co., Bethlehem, Pa. Catalog 156 describes and profusely illustrates industrial uses of the company's corrosion-resistant steel called Mayari-R. Pp. 31.

Ball Bearing Units. Stephens-Adamson Mfg. Co., Aurora, Ill. Catalog 840 describes, illustrates and has many tables of load ratings for various types of ball

Not one Snake bite, but VENEX PAID for itself

"By removing the fear most outdoor workers have of snake bites we increased the effective work of our crews," remarked a foreman of a field gang, "by equipping our men with first aid for snake bites." The VENEX Snake Bite Kit is a *complete* first aid treatment for snake bites. The pocket-size weatherproof metal container holds non-deteriorating syringe, lancet, tourniquet, swabs, adapter, ammonia inhalants, compresses and syringe lubricant with simple, easy-to-follow directions inside the cover.

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